

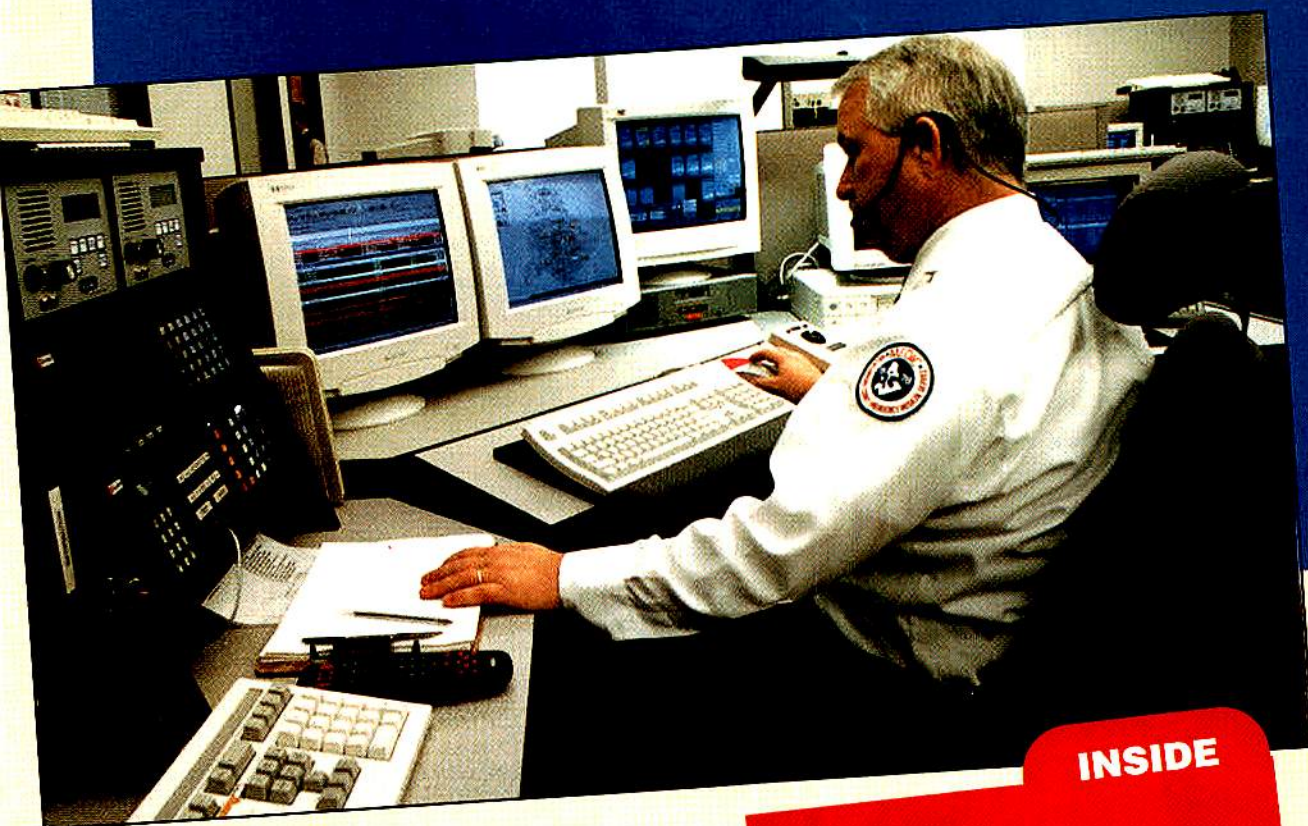
January 1998

# Mobile Radio Technology<sup>®</sup>

Technical information for paging, SMR and private wireless networks.

**EMS DISPATCH**

**COMMUNICATIONS CENTERS:  
SLASHING RESPONSE TIME**



**INSIDE**

**TRUNKING  
COAXIAL CABLE  
PAGING SYSTEMS  
PRODUCT SHOWCASE**



# Keyless Entry

Keyless Entry means no more manual setup of your IFR COM-120B. Just interface the **Super Scout** Frequency Recorder to the RS232 port of the IFR COM-120B, key up any radio and the **Super Scout** captures, displays and records any frequency from 10MHz - 1.4GHz (FM Analog). At the same time the **Super Scout** automatically tunes the IFR COM-120B, or the 1200 Super S to the frequency it captures in one second.

When you have such a powerful test instrument like the IFR COM-120B why would you need the **Super Scout**? Easy.

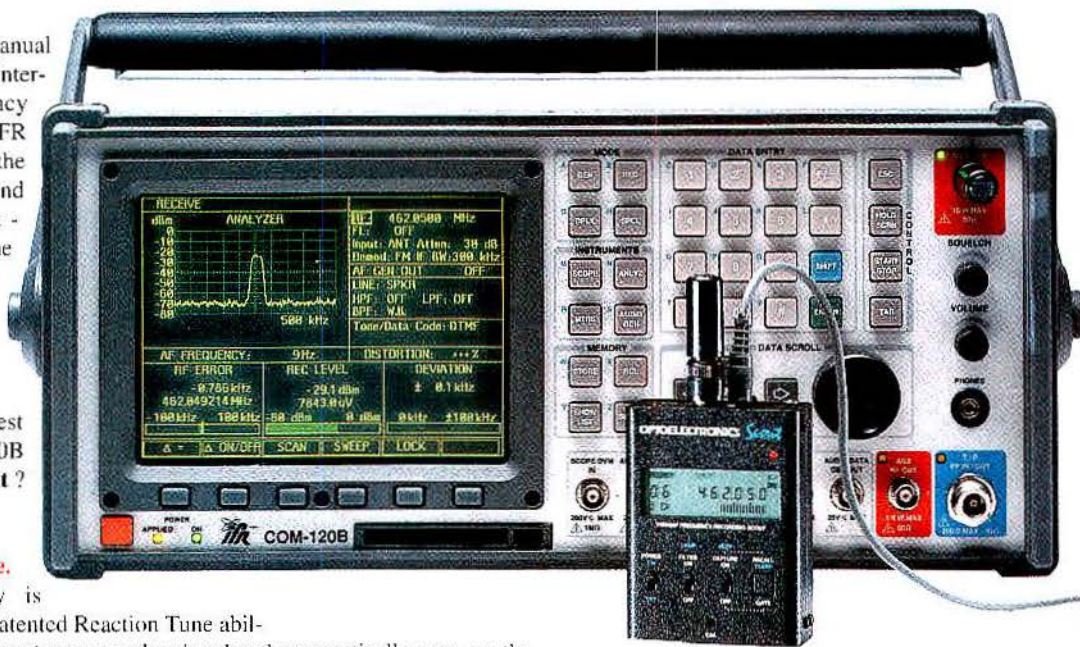
## The Super Scout can save you time.

For radios where the frequency is unknown the **Super Scout** uses its Patented Reaction Tune abilities. Key up the radio, the **Super Scout** captures the signal and automatically sets up the IFR to the radio's exact frequency, no manual setup required.

## The Super Scout can put money in your pocket.

Just imagine how many additional radios you'll be able to service in a day, a week, or all year. The **Super Scout** frequency recorder not only automatically sets up the IFR COM-120B, but it also records up to 400 frequencies in memory. With the **Super Scout** Memory Tune function you can also go back and access any frequency in memory and re-setup the IFR COM-120B to that frequency.

The handheld **Super Scout** frequency recorder comes with built-in NiCad batteries, IFR COM-120B interface cable, 1200 Super S interface cable, DB32 antenna, and power supply.



Patent No. 5,421,402

## SPECIFICATIONS

**Frequency Range:** 10MHz - 1.4GHz  
**Input Amplifier:** 50 Ohm vswr <2:1  
**Sensitivity:** <5mV 30MHz - 900MHz  
**Maximum Input:** +15dBm, 50 milliwatts  
**Time Between Measurements:** 10 milliseconds  
**Display:** 10 digit LCD w/backlight

**Timebase:** 10MHz setable to +/- 1ppm  
**RF Signal Strength Bargraph:** 16 segments 3dB per segment  
**Size:** 3.7"H x 2.75"W x 1.2"D  
**Weight:** 8.5oz.  
**Battery:** Internal 4 cell AA shrink wrapped NiCad pack  
**Power:** 9-12 VDC 1 Amp wall plug adapter, supplied



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Model C-5112



Model C-5110B

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- ☐ **RX ALL switch** for monitoring all unselected lines
- ☐ **Separate speakers and volume controls** for "selected" (TX / RX) and "unselected" (RX-only) audio
- ☐ **GROUP SELECT switch** for easy selection of TX / RX line combinations
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**On the cover:** A Mecklenburg ESMA agent in Charlotte, NC, answers calls and dispatches help to the public using American Tritech's VisiCAD software for fire and EMS. Photo courtesy of Mecklenburg ESMA, Charlotte, NC.

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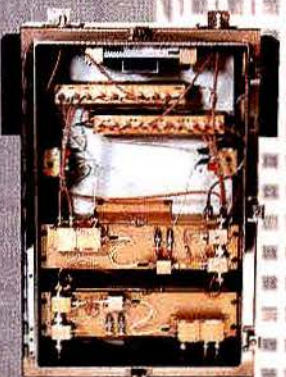
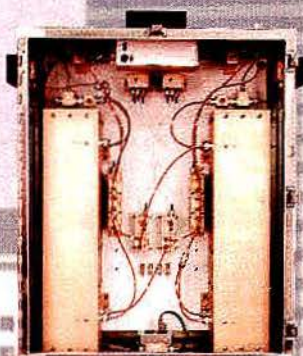


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Gain: 80 dB (typical)  
Bandwidth: 18 MHz (each passband)  
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## "Scamming . . ."



Do you remember seeing program-length TV "infomercials" (30-minute commercials dressed up to look like interview programs) in 1993 that promoted applications for specialized mobile radio (SMR) licenses? At about the same time, a series of 60-second commercials played during broadcast radio talk programs around the country, promoting the sale of SMR license application services.

Besides the broadcast advertising, telemarketers employed by the promoters were making calls, looking for suckers to pay \$7,000 apiece for applications that they could have prepared and filed themselves for \$200, according to the Federal Trade Commission (FTC), which investigated the promoters. The FTC said the applications were promoted as "low-risk, high-return investments." [our emphasis]

In a second phase of the scheme, the suckers paid about \$8,000 per unit to purchase partnership interests in an entity promising to build systems to offer mobile telephone service to the public in competition with cellular systems, again based on false and misleading claims, the FTC charged.

In January 1994, the Federal Trade Commission brought charges against Metropolitan Communications, Columbia Communications Services, Nationwide Digital Data, Stephens Sinclair Ltd., Meehan Marketing Group and a number of individuals, including Sheldon Jackler and Joan Orth. A receiver, Daniel Goodman, was appointed for the corporate defendants.

### Settlements

In 1994, Meehan Marketing Group, its principals and its top-producing salesman settled with the FTC, paying \$205,000 for "consumer redress."

On Sept. 8, 1997, U.S. District Judge Jed Rakoff of the Southern District of New

York entered judgments (representing more settlements) that required Jackler to pay \$1.6 million to victims of the scams. Orth must pay \$20,000 for "consumer redress." In July 1997, she pleaded guilty to violating a court-ordered asset freeze and was sentenced to six months' house arrest and one year's probation. The judgments continue Goodman's receivership.

Based on the information that the promoters sent their marks, the investments were ridiculous. Unfortunately, many people who don't know about the SMR industry were persuaded to send money—probably the same kind of people who respond to commercials promoting heating oil, gasoline, corn and soybean futures.

### Scam No. 1

The FTC complaint said that the promoters told investors that they could obtain a license and then lease it to another party called a systems operator. The systems operator would provide all the equipment and funds necessary to make the system operational—at no cost to the license holder—and use the license to offer mobile telephone service to the public as part of a block of 10 or 20 licenses linked together. The defendants selling application-preparation services made representations that:

- purchasers could earn \$4,000 per year within 18 months of when the systems began operations. In fact, purchasers were not likely to earn such money, the FTC said.

- a person could own only one SMR channel per geographical area. In fact, the FTC found, some companies own 100 or more SMR licenses in a single area. (Don't we know it!)

- the only way current SMR license holders or SMR service providers could acquire additional SMR frequencies was to lease them from other license holders. However, current licensees or providers could have applied for and obtained FCC permission to use additional frequencies themselves, the FTC found. (Yes, in the "good old days.")

- the SMR licenses for which customers were applying were highly valuable and likely to be worth many thousands of dollars, and that purchasing the defendants' services was an excellent, low-risk investment. Not true, the FTC charged.

### Scam No. 2

In the second phase of the scheme, some of the defendants began offering license holders—and other investors—units of general partnerships. According to the complaint, these defendants represented that the partnerships were engaged in joint

ventures to operate SMR telephone systems in various cities. This part of the scheme included representations that:

- the SMR telephone system would be a successful, economically viable competitor to the existing cellular systems in each targeted city. In fact, the FTC charged, the defendants' proposed SMR systems were technologically inferior to current cellular systems in several respects.

- each partnership was likely to yield \$2,500 a year in income. Partners were not likely to earn that amount, the FTC found.

Moreover, the FTC said, the SMR license management agreements on which the proposed systems were based could have resulted in a revocation of the licenses due to violations of FCC regulations. In light of the investment representations, this should have been disclosed.

### Remember the receiver?

This brings us back to the receiver, Daniel Goodman. Early on, in an effort to preserve assets that might be converted to reimburse the victims of the scams, the receiver asked the FCC to extend the construction period for the thousands of channels sold in the scam. One can sympathize with those who were duped. It would be good if they could get their money back; but the FCC's failure to make unconstructed channels available to hundreds of small SMR business owners isn't fair, either.

The FCC granted the waiver and gave a four-month extension of the construction period. The extension was to begin after publication of the decision in the *Federal Register*. What was maddening to SMR business owners, though, is that, since granting the waiver, the FCC has *never published* the decision, making the waiver not for four months, but *indefinite*. How many small SMR business operators would have liked to have such a waiver? Plenty. How many ever received one? None.

In the meantime, the FCC froze applications for site-specific SMR licenses in the expectation of auctioning geographic-area licenses—an auction that commenced on Oct. 28, 1997. The opportunity for small SMR businesses to apply for recovered channels has been taken from them during the period since the scams began.

Scam victims paid an estimated \$28 million in the first phase alone. Less than \$2 million has been recovered. In the meantime, the cost to small SMR operators in terms of lost equipment sales and jobs that they would provide—were their businesses to grow—cannot be calculated.

—Don Bishop



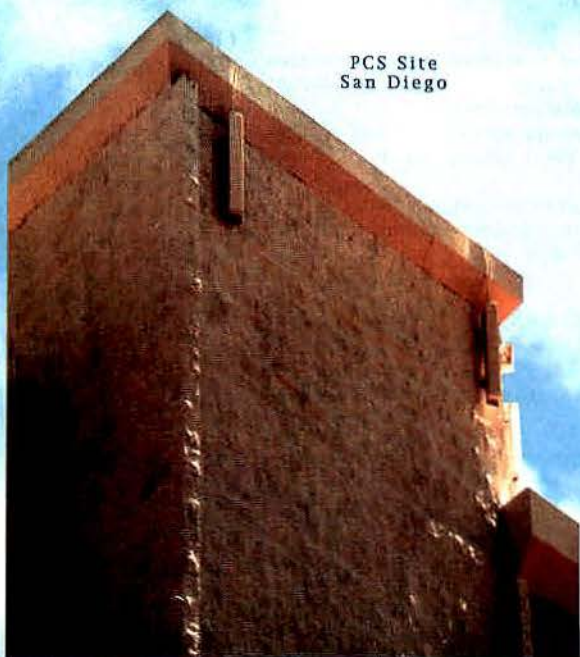
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## 1998

### February

**23-25—Wireless**, sponsored by the Cellular Telecommunications Industry Association, Georgia World Congress Center, Atlanta. Contact: 212-964-7000.

### March

**1-4—ENTELEC**, sponsored by the Energy Telecommunications and Electrical Association, Marriott River Center, San Antonio, TX. Contact: 281-357-8700.

### April

**20-23—Expo Comm/Comdex**, sponsored by E.J. Krause & Associates, McCormick Place, Chicago. Contact: 301-493-5500.

**22-24—International Wireless Communications Expo**, co-sponsored by *Mobile Radio Technology*, Las Vegas Convention Center, Las Vegas. Contact: 800-288-8606.

### May

**11-14—Telecommunications Resellers Association Spring Conference and Exhibition**, San Francisco Marriott, San Francisco. Contact: Susannah Gaylord Stoll, 202-835-9898 ext. 3009.

**18-21—Vehicular Technology Conference**, sponsored by IEEE Vehicular Technology Society, Westin Hotel, Ottawa, Canada. Contact: 908-562-3870.

**20-22—Canadian Wireless**, sponsored by the Canadian Wireless Telecommunications Association, Metro Toronto Convention Center, Toronto, Canada. Contact: 613-233-4888, ext. 102.

### June

**7-11—Supercomm**, sponsored by USTA and TIA, Georgia World Congress Center, Atlanta. Contact: 202-326-7300.

**28-July 2—UTC National Conference & Exhibition**, sponsored by UTC, The Telecommunications Association, Hynes Convention Center, Boston. Contact: 202-872-0030.

### July

**15-17—Communications Expo/Show of the Americas**, Miami Beach Convention Center, Miami. Contact: Jackie Gonzales, 305-412-9000.

### August

**9-13—International Association of Public-Safety Communications Officials (APCO) National Conference**, Albuquerque Convention Center, Albuquerque. Contact: 904-322-2500.

### September

**23-25—Personal Communications Showcase**, sponsored by Personal Communications Industry Association, Orange County Convention Center, Orlando, FL. Contact: 703-739-0300.

**23-25—PCS Latin America**, sponsored by the Personal Communications Industry Association, Orlando, FL. Contact: Cathy Graham, 703-739-0300, ext. 3706.

### October

**12-14—Wireless Apps**, sponsored by the Cellular Telecommunications Industry Association, Bally's Las Vegas, Las Vegas. Contact: 202-785-CTIA.

**14-16—TelecomLatina**, co-sponsored by *Mobile Radio Technology*, Miami Beach Convention Center, Miami. Contact: 1-800-288-8606.

### November

**11-15—Communications Marketing Conference**, sponsored by the Communications Marketing Association, San Diego Princess Resort, San Diego. Contact: Bernie Brownson, 303-371-8182.

**20—Radio Club of America**, Communications Symposium, 89th Anniversary Dinner and Awards Presentation, New York Athletic Club, New York. Contact: Gerri Hopkins, 908-842-5070.



## Mobile Radio Technology

Technical information for paging, SMR and private wireless networks

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To: Our Customers, Partners and Competitors,

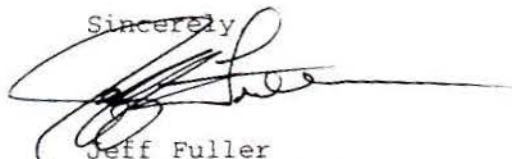
On July 31, 1997, Transcript International purchased the E.F. Johnson Company. Since the acquisition, many pertinent questions relating to the future of both E.F. Johnson and Transcript International have arisen. To answer these questions and provide some insight into the future of the two companies, I have constructed this letter outlining the plan for Transcript, E.F. Johnson and the two-way market.

Achieving our primary objective begins by integrating the two companies into one cohesive unit. Unlike many acquisitions which attempt to maintain the independence of the entities involved, we are committed to establishing a single company with the highest level of unified corporate leadership. Transcript International Incorporated will serve as the official name of the company, while the E.F. Johnson name will be used as the signature for a complete line of two-way radio products. This format allows us to utilize the strong brand recognition E.F. Johnson has built over the last 75 years, in addition to, preserving a corporate identity which remains recognizable worldwide as a leader in innovation and quality.

As the integration of the companies becomes a reality, our focus turns towards product development. Already, the technical departments at Transcript and E.F. Johnson operate in conjunction developing and improving new and existing products. Transcript's expertise in digital signal processing and voice coding combined with E.F. Johnson's RF technology and systems experience pave the way for more complex digital radio systems. This technological collaboration has only enhanced our commitment toward becoming a major provider of APCO Project 25 and highly specialized radio systems.

The future looks to be very exciting for Transcript's customers, dealers and employees. We have set our goals very high and we plan to achieve each one through proper planning and management.

Sincerely,



Jeff Fuller  
President & CEO

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Lincoln, Nebraska 68521-9918  
402 474-4800 FAX 402 474-4858  
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## Power supplies for communications servicing

By Harold Kinley, C.E.T.

The choice of a power supply for servicing communication equipment is important—particularly the dc power supplies that power mobile and portable equipment on the test bench. The power supply must provide a clean, well-regulated dc voltage, and it must be immune to strong RF fields. Otherwise, RF transmitting equipment can seriously impair the operation of the power supply. A good bench supply must meet some important parameters.

### Regulation

Two kinds of regulation apply to power supplies. One is the *load* regulation, which refers to the power supply's ability to maintain a constant output voltage under widely varying load current demands. The other is the ability of the power supply to maintain a constant output voltage under varying ac power line or source voltage.

► **Load regulation** — A well-regulated power supply is a must. The current demand from transceivers will vary with the mode of operation. In the receive standby mode, with the receiver squelched, the unit may draw a few milliamperes. In the receive mode, with the receiver receiving an on-channel signal and producing full audio output power, the unit may require a few hundred to several hundred milliamperes, depending on the audio output power rating of the receiver and the efficiency of the receiver design.

When the transmitter is keyed, the current requirement could be 10A–20A or more depending on the transmitter power and the efficiency of the transmitter design. In spite of the widely varying load demands, the power supply voltage should remain constant. The degree of regulation is usually described as a percentage. The formula for defining the percentage of regulation of a power supply is:

$$\% \text{ REGULATION} = \frac{V_{nl} - V_{fl}}{V_{fl}} \times 100$$

where

$V_{nl}$  is the no-load voltage

$V_{fl}$  is the full-load voltage.

For example, if a power supply is set to an output voltage of 13.6V under no-load conditions and then drops to 13.1V under full-load conditions, the percentage of regulation of the power supply is:

$$\frac{13.6 - 13.1}{13.1} \times 100 = \frac{0.5}{13.1} \times 100 = 0.0382 \times 100 = 3.82\%$$

Typical load regulation should be no greater than 1% on a good-quality power supply. Much lower values are possible with higher-quality dc supplies.

► **Line regulation** — Suppose that a power supply is rated at 1% regulation over an ac input line voltage of 110V–120V. This should be measured at some fixed value of load current, say 50% of the rated load current. If the power supply voltage at 50% load current is 13.5V, then this voltage should not vary more than 0.135V as the line voltage changes from 110V to 120V. Typical equipment ratings for power line voltages are 105Vac–125Vac.

### Ripple

Ripple on the dc output voltage should be kept to a low value. Otherwise, the

---

*...The ripple can adversely affect the equipment...and lead you to believe the problem is in the equipment when it is actually in the power supply.*

---

ripple can adversely affect the equipment you are testing and lead you to believe the problem is in the equipment when it is actually in the power supply. Any hum or extraneous noise introduced by the power supply must be negligible in comparison with the hum or noise present in the equipment under test. Ripple from the dc supply can be measured using an oscilloscope. Ripple levels of 5mV–10mV should cause no harm in troubleshooting communications equipment. Don't accept ripple levels much greater than this. Much lower ripple levels are common with higher-quality equipment. Lower-current supplies usually are accompanied by lower ripple levels. Ripple specification is usually stated at the continuous load rating of the power supply.

### Voltage adjustment

A voltage adjustment allows the power supply to be operated over a range of

voltage to meet the requirements of different equipment. Generally, it is desirable to operate mobile communications equipment requiring 6A–16A at 13.6V. This is spelled out in EIA standards. However, when testing a transceiver, it is often desirable to run the voltage above and below the standard test voltage to flush out voltage-related problems within the equipment. Generally, equipment can be operated at a voltage 15% above or below the standard test voltage without causing harm to the equipment. Be careful not to exceed the maximum dc supply rating of the equipment. You may cause more trouble than you had at the beginning. Most supplies designed for servicing 12V equipment are adjustable up to 15V–16V, so it is not possible to exceed the safe dc supply rating of the equipment.

### Metering

It is highly desirable to have separate metering for both the voltage level and the current level of the power supply. Although analog meters are less expensive, the digital meters are much more accurate, probably 10 times more accurate than the analog type. For example, the specification for an analog meter might be  $\pm 5\%$  while the specification for the digital meter might be  $\pm 0.5\%$ . However, analog current meters are sometimes more advantageous. If you are using a power supply with the analog metering, it is a simple matter to use a more accurate digital voltmeter to set the output voltage to the proper point and then mark the scale of the analog meter at the proper reference point for the standard test voltage.

### Safety features

Safety features such as overvoltage protection and current limiting are important in order to protect the equipment being serviced or tested. Imagine what would happen if the power supply voltage suddenly increased beyond the acceptable input level of the equipment under test. The equipment would be likely to suffer

(continued on page 36)

---

Kinley, a certified electronics technician, is regional communications manager, South Carolina Forestry Commission, Spartanburg, SC. He is a member of the Radio Club of America. He is the author of *Standard Radio Communications Manual: With Instrumentation and Testing Techniques*, which is available for direct purchase. Write to 204 Tanglewyld Drive, Spartanburg, SC 29301. Kinley's email address is [hkinley@aol.com](mailto:hkinley@aol.com).

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Circle (18) on Fast Fact Card



# Slashing response time

*The Mecklenburg ESMA in Charlotte, NC, improves its ability to respond to 9-1-1 calls.*

By Michael J. Major

If you are a citizen and you dial 9-1-1, you expect help immediately. But suppose you are the one responsible for providing that help, and you simply don't have the resources to respond in a timely fashion. The Mecklenburg Emergency Medical Services Agency (ESMA), based in Charlotte, NC, faced that problem. ESMA serves both that city and Mecklenburg County, comprising 542 square miles.

So, in November 1996, a consulting firm, Fitch & Associates, Platt City, MS, was hired to work with county and medical officials to improve the situation. The company determined that, based on national standards, the response to all emergency calls should be less than two minutes from the time the public safety answering point (PSAP) received the call until a unit is dispatched. Various improvements were implemented, including retraining staff, hiring more paramedics and putting more emergency vehicles on the road.

But a key ingredient to the turnaround was upgrading the communications system. American TriTech, San Diego, was the system integrator hired to redesign, upgrade and implement the system. Chris Maloney, president of American TriTech, said that the two main tasks were to incorporate a new computer-aided dispatch (CAD) system to replace the outmoded one installed in 1993 (designed primarily for nonemergency convalescent transportation), and to merge fire dispatch with ambulance dispatch, the two systems both having previously been separate.

A clear priority, said Barry Bagwell, communications systems manager for Mecklenburg ESMA, was a records management system that allowed high-performance, real-time decisions on how best to use and move the response vehicles. To this end, Global Positioning System (GPS) technology was added, supplied by Trimble Navigation, Sunnyvale, CA. The radio system was upgraded to Motorola's CRT Gold Series, with the previous 9-1-1 PSAP equipment being replaced by Positron, Montreal, and digi-

tal logging equipment provided by Seltronics Eyretel, Landover, MD, with console furniture from Watson Furniture Systems in Bainbridge Island, WA.

"What we wanted to do was reduce response time, while also expanding service into the fire area, so we felt we had to have a better picture of where the vehicles were at all times, hence the addition of our automatic vehicle location (AVL) system. We needed a CAD system to accommodate that position information and to display it on a high-resolution map in the dispatch center," Maloney said. The ESMA ambulance fleet consisted of about 35 vehicles, 18 to 25 of which were on duty at any one time, along with the assorted vehicles from 17 volunteer fire departments. Also to be accommodated were about 55,000 calls to 9-1-1 received annually.

In the old system, dispatchers and PSAP call takers used a single phone line. Under the current system, every dispatcher and call taker has two monitors linked to one Windows-environment PC in every position. One monitor displays traditional CAD information such as incoming requests for service and vehicle status. The other monitor depicts a detailed map showing the location of the vehicles in the county. The system includes a number of tools that help dispatchers reduce response time.

Vehicles are not assigned to particular areas. Rather, they are kept in a fluid state so that the system can analyze data, predict where the next response might occur and then make the best use of that vehicle. "It's a bit like a zone defense in basketball," Maloney said. "If one player breaks for the basket, then the others arrange themselves to best cover the court."

Historical data are analyzed by the system in two ways. The first is by the time of day and day of the week, through which the system adjusts to an expected call volume and provides for the appropriate



The VisiCAD system at the Mecklenburg EMS Agency includes GPS interface, high-resolution on-screen maps and vehicle routing and is intended to reduce response time.

Major is a writer in Anacortes, WA.



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staffing levels.

The system adjusts the staffing level to ensure an optimal number of units are on the road at the peak periods. "At Denny's you'll find more wait staff on duty at 10 a.m. Sunday morning than at 2 a.m.," Maloney said. "It's a basic concept, but for some reason it's not utilized a lot in public safety."

The second mode of analysis is spatial. "The system looks at historical demand

patterns, then shows the user where to place those vehicles, depending on what is available at which point of time, and then does it for every hour of the day for every day of the week. In other words, there are 168 plans," Maloney said.

The system then calculates what happens when vehicles are in use. For instance, if 10 vehicles are on duty for 8 a.m., Monday, what happens if one, two, three or more are responding to different



VisiCAD for ambulance provides detailed call data. The data can be exported to spreadsheet applications or output to a color printer.

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incidents? Where do the remaining ones go?

The AVL system determines where all of the vehicles are at all times. GPS polls the vehicle rapidly, every five to 10 seconds, following the route, with the ability to provide directions if the driver gets lost. But if the vehicle is in a non-urgent status, whether parked at the station or offloading a patient, the polling diminishes.

The AVL system provides a map on the screen showing where the units are so that if there is a 9-1-1 call, the closest unit can respond. The system automatically chooses this unit, but the dispatcher can override this choice if, for some reason, another vehicle is more appropriate.

In some situations, however, the vehicle might move from its last location without notifying the dispatcher. "If the dispatcher assigns a vehicle on the basis of its last location, but it is actually five to 10 miles down the road, the result might be a serious error and poor response time," Maloney said.

For this eventuality, the AVL system incorporates a mobile status terminal. The driver keys in seven main status reports, such as the unit "has started toward the scene," "has arrived," "is leaving with the patient," or "has arrived at the hospital."

The CAD system picks up these status changes and updates the displays on the system. By automating the status changes, about 80% of the dispatcher's work load is eliminated, freeing him to do more important things such as managing the vehicle routes," Maloney said. By automating these status changes into short, standardized messages, radio time is considerably cut back, thus helping the agency to manage spectrum efficiency.

"Unit utilization is really a measure of productivity," Bagwell said. "Our ultimate goal is to minimize response time and to do that with the fewest number of vehicles or unit hours." Bagwell said the system also allowed the agency to produce and to maintain its own maps. The agency works closely with the county,



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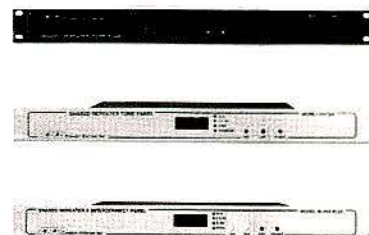
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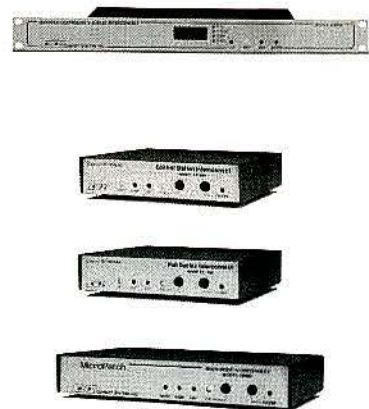
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which identifies changes, such as a street condemnations or name changes. It downloads that information every Sunday so that the maps that then go up on the 9-1-1 response screens are always current.

The next system became operational in September 1997. Bagwell reports that the

agency, in a year's time, has moved from 77% to 86% compliant. Much of that was due to the other factors such as hiring more paramedics and purchasing more vehicles. With the new communications system in place, Bagwell anticipates the agency will meet the required 90%

compliance standard.

"It's one thing to reach the 90% compliance stage, but the real test is maintaining it with consistency, with real time monitoring. But that's what this new system will enable us to do," Bagwell said.



### **Proper public safety starts with consoles**

The basis of proper public safety is communications. Firefighters, police and emergency medical services usually answer calls when they are coming to someone's rescue, or they are dispatched to the scene of danger. What lies behind proper public safety, therefore, is proper communications equipment.

Patriot Ambulance in Lowell, MA, and the Verdugo Communications Center, in Southern California, have chosen Vega consoles to aid in the protection of the public.

Patriot Ambulance installed Vega's 10-line and four-frequency, tone format control console, model C-5110B. The console is operational at one of its three dispatch stations, and the company is planning additional Vega systems to

strengthen communications among 250 employees and 40 service vehicles.

The C-5110B provides simplex operation over two-wire or four-wire lines and duplex operation over four-wire lines. Additionally, dispatchers can monitor (through a second speaker) any combination of those 10 lines that are not already selected for transmit and receive control.

The Verdugo Communications Center, a central dispatch facility, services five fire departments in Southern California using two Vega C-5112 10-line and multiple-frequency modular consoles as backup communications equipment to its main on-line Motorola system.

In case of equipment failure, the center immediately switches to its two Vega

emergency system consoles for dispatching communications to fire departments in other cities. The consoles were purchased one year ago to support the system.

The compact C-5112 unit provides instant PTT and timed mute features among many other features. The console includes two speakers and volume controls to independently adjust selected-line and unselected-line audio levels. Individual volume controls are provided for each "unselected receive" line.

Any line or combination of lines can be selected for transmit and receive operation. The 10 "unselected receive" switches allow any combination of lines to be monitored through the "unselected" speaker.



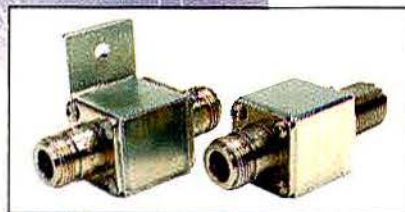
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# Overlay scan-based trunking below 800MHz

*Scan-based trunking systems for UHF and VHF channels below 800MHz already comply with FCC requirements to monitor channels before transmission without the need for dedicated data channels for system control.*

By Eliot F. Terborgh

There are several advantages for the private carrier licensee that is considering converting conventional 450MHz repeaters to trunked operation. Operators of shared community repeaters can achieve higher customer loading (and greater profits) from the existing system. Trunking is also advantageous in a private "campus" system of two or more VHF or UHF conventional channels used for plant security or maintenance.

Converting conventional channels to trunked operation will increase system capacity while providing privacy, system security and advanced features, such as selective and emergency calling.

The efficiencies and features of trunked radio are well-known to experienced 800MHz system operators. The primary advantages of any trunked radio system can be summarized as follows:

► **Automatic clear channel selection**—In a conventional radio system, the user may only have access to a single channel. By FCC regulation, if the user wishes to make a call, he must first monitor the channel to make sure it is clear. If the channel is busy, the user must continue to monitor the channel until the co-channel user has terminated the conversation. By contrast, in a trunked system the channel selection is automatic. When the user initiates a call, the trunking system electronically "monitors" each channel and selects one clear (unused) channel from many possible channels.

► **Channel privacy**—In a conventional system, other co-channel users can easily eavesdrop on conversations. In fact, channel monitoring is required by the FCC when initiating a call, as described above. In a trunked system, other system users cannot listen in on other conversations. A radio can only join a conversation when directed by the trunking controller.

► **Channel exclusivity**—In a conventional system, discourteous co-channel users can "jump" on a channel in the middle of another conversation, interrupting the call in progress. In a trunked system, once a channel is selected, it becomes exclusive for the duration of the transmission. Other users cannot interrupt or interfere with the call.

► **Selective calling**—In most conventional radio systems, selective calling is an expensive add-on option or may not be available at all. On the other hand, some trunked radio systems provide extensive selective calling capabilities as a standard feature. This means that users can selectively call different groups or individuals in the system. Each user is typically assigned a unique individual ID code and one or more group ID codes. These codes can be used by other users in the system to specify the groups or individuals with whom they wish to communicate.

## Growth of trunked radio

During the past 15 years, the specialized mobile radio (SMR) industry has experienced tremendous growth. Most of this activity has been limited to portions of the 800MHz and 900MHz frequency bands that have been allocated for trunked radio by the FCC. The popular trunking protocols have been various formats offered by Motorola (Smartnet, Smartzone, Privacy Plus), the LTR format developed by E.F. Johnson, and GE Mark V and EDACS, offered by Ericsson.

In recent years, however, most of these SMR channels at 800/900MHz have been acquired by a few large carriers, most notably Nextel Communications. In the

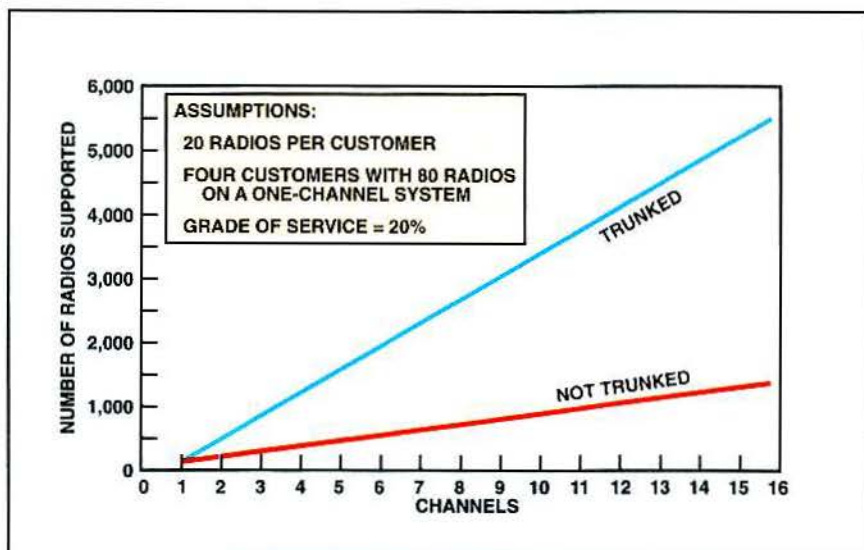
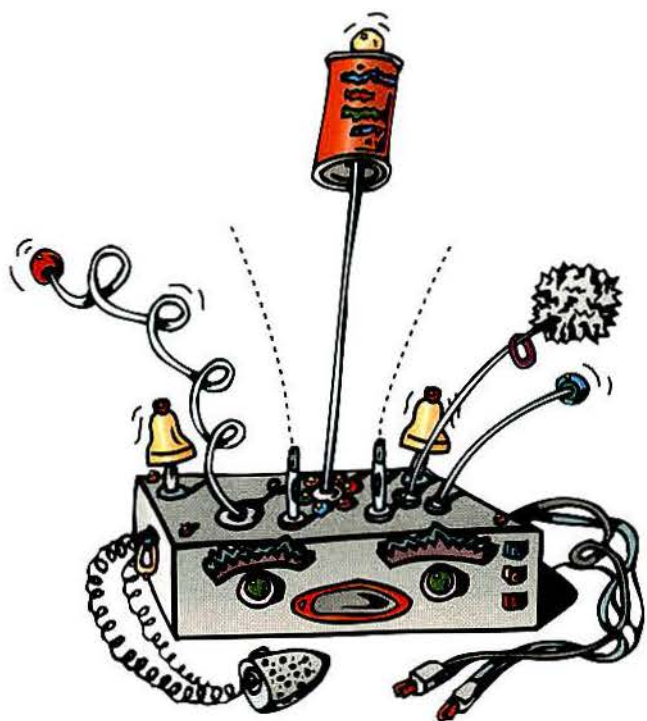


Figure 1. Impact of trunking conventional channels.

Terborgh is president of SmarTrunk Systems, Hayward, CA. SmarTrunk manufactures an overlay scan-based trunking system, as described in this article, trademarked under the name SmarTrunk II.



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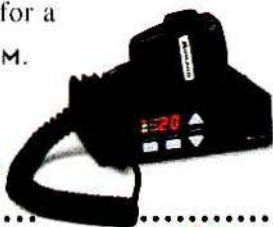
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process of acquiring these channels, Nextel has bought out hundreds of small entrepreneurs who pioneered this industry in the 1980s. As a result, many of these same entrepreneurs (at least those who are not ready to retire) are now "looking for an encore." But with Nextel's market dominance and the freeze on new SMR license applications, there is simply no more spectrum (and no more opportunities) available at 800/900MHz.

Changes in 1997 to the FCC Part 88 rules allow trunking in the 150MHz and 450MHz bands. By acquiring conventional UHF repeaters and converting them to private carrier status, displaced SMR entrepreneurs can now establish multi-channel trunked networks, just as they did a decade earlier at 800MHz.

#### The trunking advantage

If you operate two community repeat-

ers, and each channel is busy 20% of the time, there is a 20% chance that the channel assigned to a given customer will be busy when one of his mobile groups wishes to make a call. But, if the two channels are trunked together, the trunking system will select an open channel when a mobile group wants to make a call.

As shown in Figure 1 on page 16, the odds that both channels will be busy at the same time is only 4%. This means:

- Existing customers will receive a much higher level of service, or
- 2.5 times as many customers can be added to the system with the same level of service.

#### Part 88 trunking rules

In its changes to Part 88, the FCC authorized the use of "centralized" trunked systems for VHF and UHF frequency bands. Centralized trunking refers to trunking systems that use dedicated (exclusive) control channels for data communication between the mobiles and the trunked repeaters. In such systems, the mobiles constantly monitor the control channel for channel assignment instructions. When a group call is initiated, the trunking controller transmits instructions telling the mobiles in the group to switch to a voice channel assigned for that conversation. Thus, the "brains" of the system are in the system controller at the repeater site.

Most trunking systems, such as MPT-1327, Motorola's Smartnet, and E. F. Johnson's LTR are centralized systems. Because they are designed to use clear frequencies, these systems are widely used in the 800/900MHz frequency bands where the FCC has granted the use of exclusive frequencies for trunked SMR service. However, these trunking formats are inappropriate for use at VHF and UHF frequencies because of the lack of exclusive channels in those bands.

To get around this problem, the FCC requires potential system operators "... to obtain some form of exclusivity in their respective service areas." This requires the operator to obtain written permission from all other licensees within a 70-mile radius of the proposed base station, similar to the FCC rules for telephone interconnect in major metropolitan areas. Due to the frequency congestion in these bands, this requirement is extremely difficult to meet. All other users on the proposed trunked channels and immediately adjacent channels would have to agree to convert to trunked operation. Since, by definition, centralized trunked systems require exclusive channels, the

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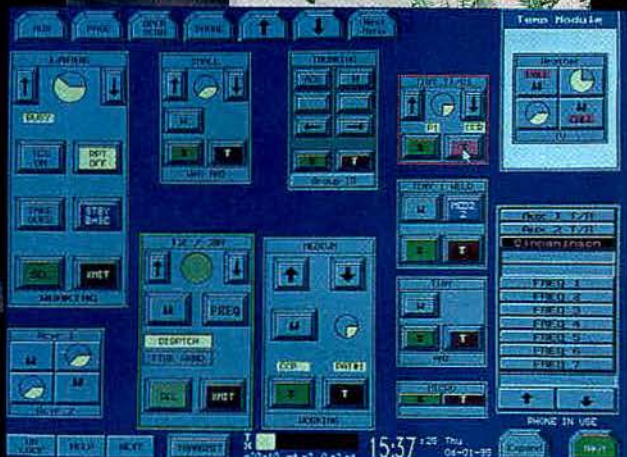
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other affected users would have to agree to a simultaneous conversion of their radio systems, which would require scrapping their conventional equipment and purchasing all new mobile radios. As independent businesses, it is extremely unlikely that they would all agree to such a plan.

#### Scan-based trunking systems

Unlike centralized trunking systems, scan-based systems do not require exclu-

sive channels. Because the channel selection intelligence is in the mobiles, scan-based systems can co-exist with conventional users on the same channels. When a call is initiated by a mobile unit, the channel assignment is determined by the logic in the mobile, not by a controller at the repeater site. So if the channel is busy with a conventional user (or even a co-channel user on another system), the mobile will consider the channel to be

busy and will select another channel.

The advantages of scan-based system can be summarized as follows:

□ Since they are not considered "centralized" systems, the onerous FCC frequency coordination requirements described above do not apply.

□ They have always been "legal" for use below 800MHz because they fully comply with the FCC requirements to monitor the channel before transmitting and do not use dedicated data channels for system control.

□ Scan-based trunking protocols will operate on non-exclusive channels. This not only allows the system to operate in the presence of conventional users on the same channel, but it also allows a system operator to gradually convert conventional users to trunked operation.

*This not only allows  
the system to operate  
in the presence of  
conventional users . . .  
it also allows a system  
operator to gradually  
convert conventional  
users to trunked  
operation.*

□ They are economical due to the lower cost of both the trunking controllers and the mobile radio equipment.

□ They require less technical training to install and maintain.

#### Overlay scan-based trunking

An overlay scan-based system means that, in many cases, the system can be installed with an existing two-way radio system. This means it may be unnecessary to buy new radios or repeaters to achieve the benefits of trunking. The system requires a proprietary controller connected to each repeater and a mobile logic board installed in each mobile or portable radio in the system. The system will accommodate as many as 16 channels, which may be gradually added as your system expands. Customized logic boards are available for a variety of brands and models of popular mobile and portable transceivers. In many cases, the logic board simply plugs into the radio.

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efficient use in either a dispatch-only mode or a combination of dispatch and telephone interconnect service. If you choose the combination mode, you can limit telephone access to only certain mobiles while denying access to other mobiles. You can further limit those mobiles with telephone access to local calls only, or you can allow certain mobiles access to toll calls or long-distance calls.

The system keeps track of all calls that are made on the system, whether they are radio dispatch calls or telephone calls. It records both incoming calls and outgoing calls. It does this through call accounting records that record the date, time, type of call, number being called and the number of the mobile subscriber who is initiating the call. The call accounting records provide the data for airtime billing.

#### System security and privacy

Each mobile subscriber is assigned a confidential paging code, which is transmitted via a proprietary, digital signaling protocol. To allow any mobile to work on the system, this paging code must be installed into the memory of the trunking controller. Without it, a mobile is not allowed access to the system. This feature

prevents the system pirates from adding mobiles to their fleet and not advising the system operator.

Once a mobile has acquired a channel, only the mobiles that have been called can hear the conversation. Other mobiles cannot gain access to the channel to hear any of the conversation. This privacy applies whether the call is a dispatch call or telephone call.

#### Gradual migration

One of the key features of overlay scan-based trunking for applications below 800MHz is the ability to gradually convert conventional users to trunked operation. In most major metropolitan areas, channels in the 450MHz band may have two or more conventional repeaters with a dozen or more user groups operating within range of each other. A scan-based system with the channel selection intelligence in the mobile can co-exist with these conventional users. This is done by cross-connecting the controller with a conventional CTCSS tone panel on each channel. When a subscriber is using the channel, the conventional tone panel is "locked out," preventing conventional users from accessing the channel. On the

other hand, when a conventional user has the channel, the trunked users are locked out.

Obviously, the efficiency and benefits of any trunking system will be reduced by the presence of conventional co-channel users. But this ability of the system allows the private carrier licensee to gradually convert conventional users to trunked operation over a reasonable time.

#### The 450MHz environment

In logic-trunked radio (LTR), the subscriber radio must receive instructions from its home channel before it can initiate a call. As a result, all home channels must be assigned to a clear channel. Otherwise, whenever a co-channel user is on the air, all radios assigned to that home channel will be unable to receive instructions and, consequently, unable to initiate or receive calls of any kind.

Since the 450MHz spectrum is heavily populated in the United States, obtaining a clear channel may not be an option. With scan-based trunking, all of the channels in the system may be shared with co-channel users since all the mobiles in the system monitor for a foreign carrier before selecting a channel.



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# Coaxial cable for wireless communications

*The most important lines of communication are the ones closest to home.*

## By the MRT staff

System coverage, spectrum efficiency and cost-effectiveness all drive wireless communications technologies. Yet, in the rush to improve communications systems, it is often the proverbial "nail in the shoe of the horse that missed the battle" that gets overlooked. Of all the elements in land mobile, cellular, paging and PCS systems, the most unassuming is also the most ubiquitous—coaxial cable.

Coax is a major part of a technician's work: for transmission lines, for the numerous feeders and interconnects that link system components and, in recent years, "leaky" cable for in-building antenna systems. The essential idea behind coaxial cable (for the first two cases) is simple and elegant: two concentric conductors to

provide a self-shielded line, minimizing radiation loss that might affect other components, with as little attenuation as possible. Because they have a range of impedances from 30Ω to 100Ω and no external fields (except intentionally, with leaky lines), other than at the terminations, coaxial lines are used everywhere in RF. In practice, a number of factors complicate the choice and use of coax. Size, insertion loss, flexibility, connectability, attenuation and cost are all variable when considering different applications and environments.

## Reviewing the basics

The basic elements of a coaxial line are a center conductor, a separating dielectric medium, an outer conductor and a jacket. The composition of these elements varies from manufacturer to manufacturer, and

usually depends on the use.

► **Center conductors** — Heat is one of the factors affecting the power capability of a coaxial line, and heat is mostly generated in the center conductor. For wireless applications, center conductors are usually solid copper wire. Some stranded center conductors have been introduced that trade slightly higher attenuation for the benefit of additional flexibility in applications that require tight turns or for rotating antennas. Temperature variations can also affect the length and connectivity of the center conductor over long runs, so some manufacturers stress the bonding between the conductor and the surrounding dielectric.

► **Dielectrics** — Dielectrics perform two functions: they isolate (insulate) the two conductors and transfer heat from the inner conductor outward. The type of dielectric used limits the power handling of the line. (The peak power handling, or voltage breakdown, of the coax is also frequency-dependent.) Several dielectrics are in current use: primarily air, synthetic beads and air, solid synthetics (including polyethylene [PE], polypropylene [PP], tetrafluoroethylene [TFE] and Teflon), and synthetic foam. Foam increases the velocity factor of the line and simultaneously reduces line loss. Manufacturers have even produced varieties of foam, with different bubble, or cell, structures. Compression strength of the foam can be a factor in certain types of installations.

Air dielectrics are used primarily on transmission lines in exposed settings. Because condensation in the line can occur when the ambient air temperature reaches the dewpoint of the air within the line, dry-gas pressurization or dehydration equipment can be used. This serves to prevent corrosion, voltage breakdown and an unwanted increase in voltage standing wave ratio (VSWR) from degraded electrical performance of the conductors.

► **Outer conductors** — Perhaps the widest variation, and basis for competition, among various coaxial cable types

**The following companies are among the manufacturers and suppliers of coaxial cables and connectors. For a complete list, refer to the Buyers' Guide section of MRT, December 1997, page 22.**

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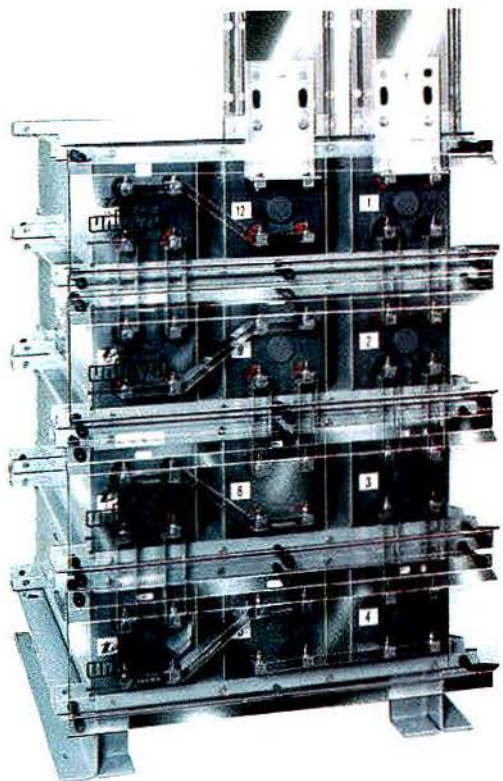
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lies in the outer conductor. Outer conductors may be solid (including smooth-wall, corrugated or helical types), tape, braid or a combination. Proponents of solid outer conductors point to their moisture resistance and consistent electrical performance. Braiding proponents point to the comparative lower cost, simpler connectivity and less likelihood of permanent damage from kinking. Some technicians prefer to use corrugated conductors outdoors for their low-loss capability, such as in antennas feeders, and use braided conductors indoors, but overall desired performance and use should be considered for each system installed. One particular concern for inter-rack and intra-rack connections is the bending radius ability of the cable.

► **Jacketing** — Most RF coaxial cables are jacketed with polyvinylchloride (PVC) plastic because it provides flexibility and a moisture barrier in a relatively thin skin. Elastomer jackets are also used in high-flexibility types of cable. Additional treatments are given some cables used outdoors to block deterioration of the plastic by UV radiation from the sun. Such deterioration can lead to moisture intrusion of the line. For instal-

lation purposes, the ease of stripping also depends on the jacket type.

As mentioned previously, bonding of these four basic cable elements to each other is receiving increased attention from manufacturers, particularly the bonding of the center conductor to the dielectric and the bonding of tape-and-braid outer conductors to the dielectric.

#### Radiating cables

A radiating cable couples the RF energy propagating along its length to the surrounding environment, with a minimum of downline attenuation, and thereby functions as a continuous antenna. Used in bounded locations, such as tunnels or in buildings, radiating cable has shields or milled openings designed to radiate low levels of energy. Placement of these lines next to conductive or high-dielectric constant materials (the ground, a tunnel wall, in free-space, etc.) can increase or decrease desired performance.

#### Other factors

Signal loss as a measure of transmission performance for coaxial cable is usually quoted in terms of decibels per 100 feet. Variations among manufacturers

are about 0.3dB at 450MHz and 0.4dB at 900MHz. In most mobile communications applications, low loss, rather than high power capacity, determines cable size. Shielding from interference is another factor, particularly between transmit and receive cables. Shielding in semi-rigid cables with solid outer conductors is about 120dB. Tape and braid flexible cables provide about 90dB of shielding. With either type, the weak point in shielding is where the cable joins the connector.

Codes and standards for your cable installation should also be considered. Is a plenum-installation fire rating required? Do military-type performance standards have to be met? Time required for installation and maintenance, dependability of supply, material cost, crush or compression strength are all variables that are valued differently for each type of user, commercial, public or private, and each type of installation, transmission or interconnection.

Consult with several manufacturers or their distributors. Get flexibility, installation, cost and performance quotes that are consistent with the environment and system design for your specific application.





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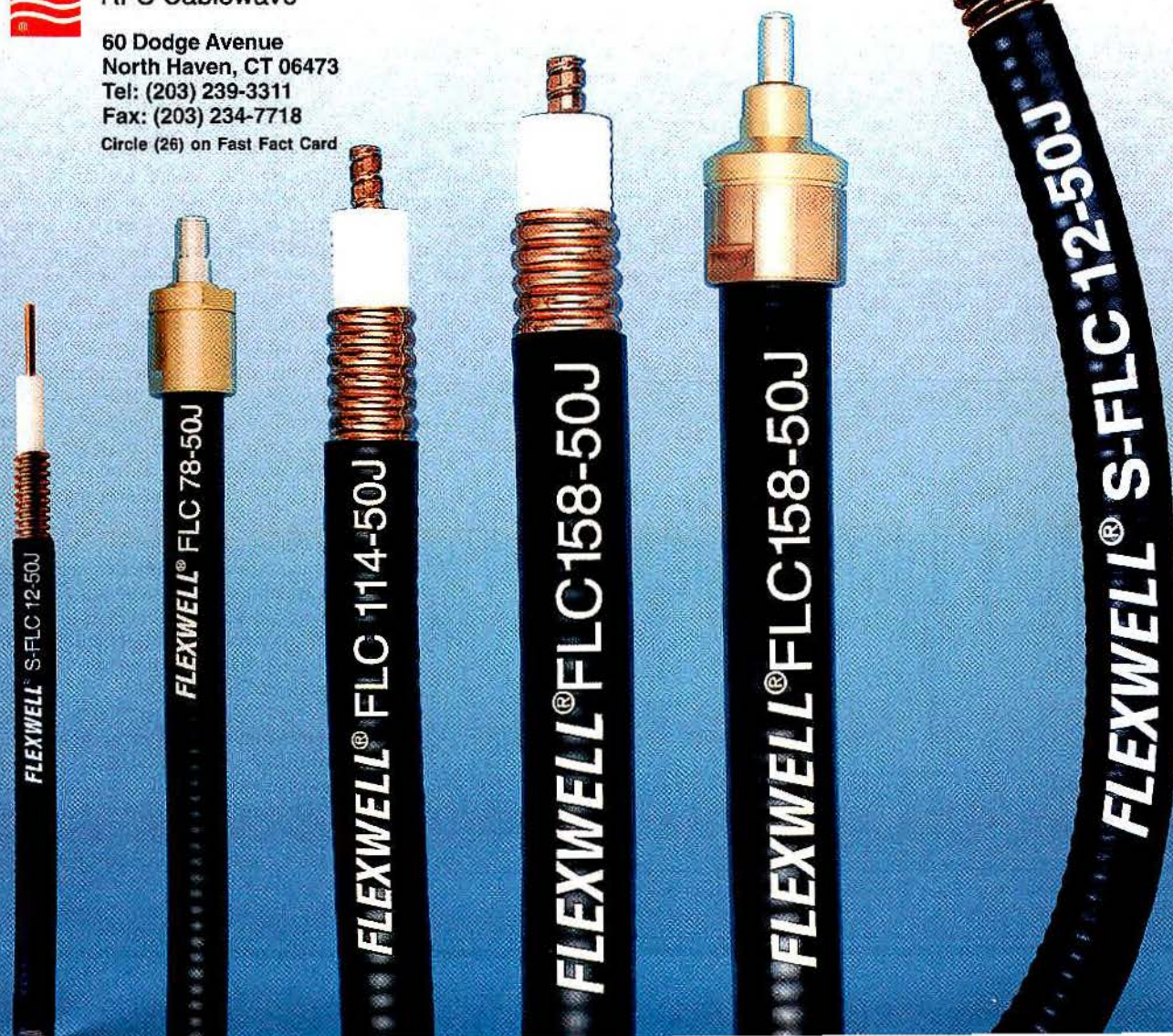
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# System design considerations for high-speed paging

*The advent of modern high-speed paging formats compels wireless messaging carriers to take a closer look at the phenomena affecting system performance in order to optimize their systems effectively and efficiently.*

By Chris Osterloh

Optimizing system performance has been a continual process for wireless messaging carriers since the introduction of modern high-speed paging protocols. Over the past several years, operators have been designing and operating systems at higher data rates with increasing success.

However, analyses of the operating environment, adjacent- and co-channel interference, simulcast delay spread and frequency offset considerations suggest that further improvements to system performance and reliability are possible.

The mechanisms known to produce increased error rates in modern, high-speed, paging systems are examined.

Chris Osterloh is a systems engineer with Glenayre in Quincy, IL.

Guidelines are also presented to aid in improving system design, development and performance.

## Environmental considerations

The first consideration must be the type of environment in which the system will be operating. The surrounding environment can have a dramatic effect on the system performance and required transmitter density. Obviously, we cannot do much to change the surrounding terrain beyond accounting for it in the propagation analyses and system planning.

The surrounding terrain and building density have a significant effect on the severity and frequency of signal fades. Fading is normally caused by a number of multipath components arriving at the receiver out of phase. If a majority of the components are out of phase with each other, they combine destructively to produce a large decrease in the received sig-

nal strength. Fading can also be caused when the signals from two or more simulcast transmitters arrive at the receiver out of phase. This is often called *zero-beating* and can be significantly reduced by employing frequency offsets throughout the system. Urban environments are especially harsh when it comes to fading due to multipath components. A typical received signal strength plot is shown in Figure 1 below. The figure shows the instantaneous signal level fluctuations due to multipath fading in an urban environment.

To compensate for the fading induced by a given environment, the average signal level at the pager must be increased. This is done to ensure that the pager will have sufficient signal strength during all but the most severe fades. It is not practical to compensate for every signal fade, but with the appropriate increases in signal strength, the effects of fading can be made negligible. Recent testing suggests approximate guidelines for the amount of additional power that is required to compensate for multipath fading in various environments. A summary of the results are given in Table 1 on page 30. The values are based on a code-word-error-rate of 1%. This translates to a success rate of about 99% for tone-only pages, 97% for 10-digit numerics, and 90% for 25-character alphanumeric pages. (Success is defined as the reception of the page without errors.) These values do not include any building attenuation factors; they are solely to compensate for the effects of multipath fading.

## Adjacent-channel interference

Another consideration, adjacent-channel interference, is often difficult to characterize during the system design process. As you would expect, high levels of adjacent-channel interference cause problems with paging reliability. To

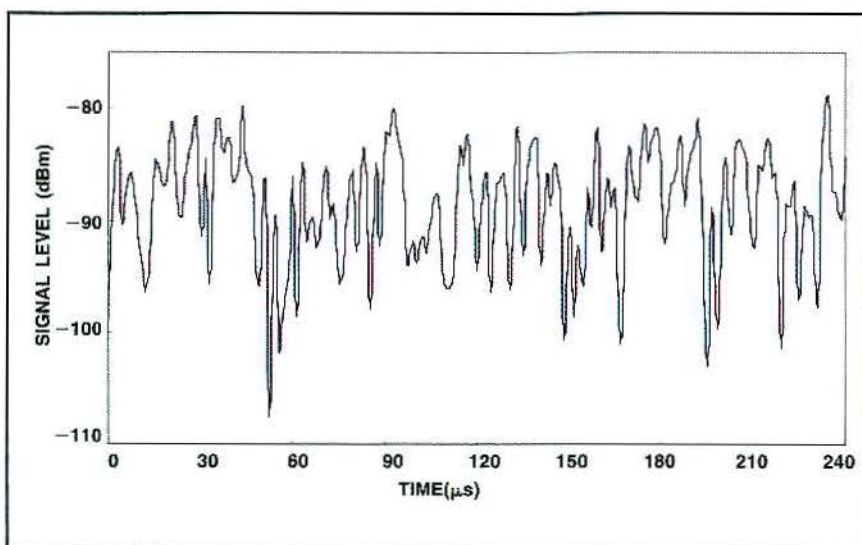
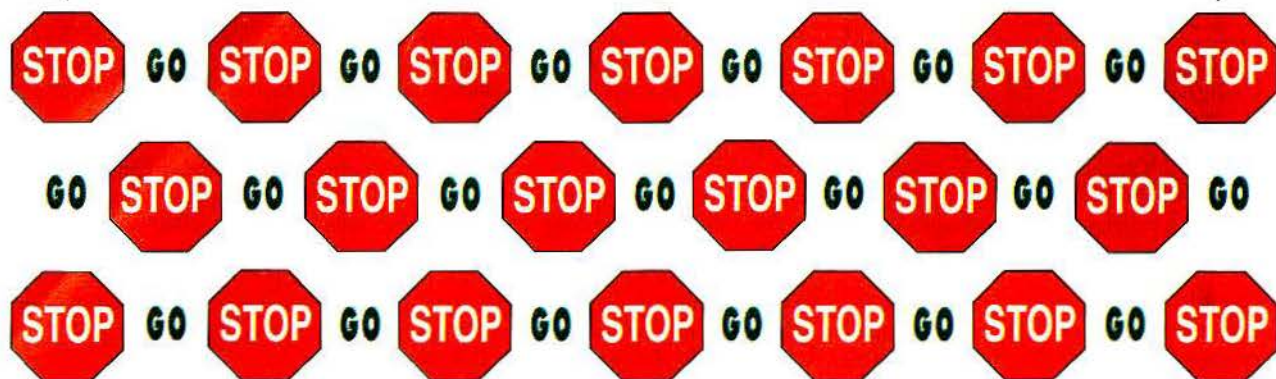


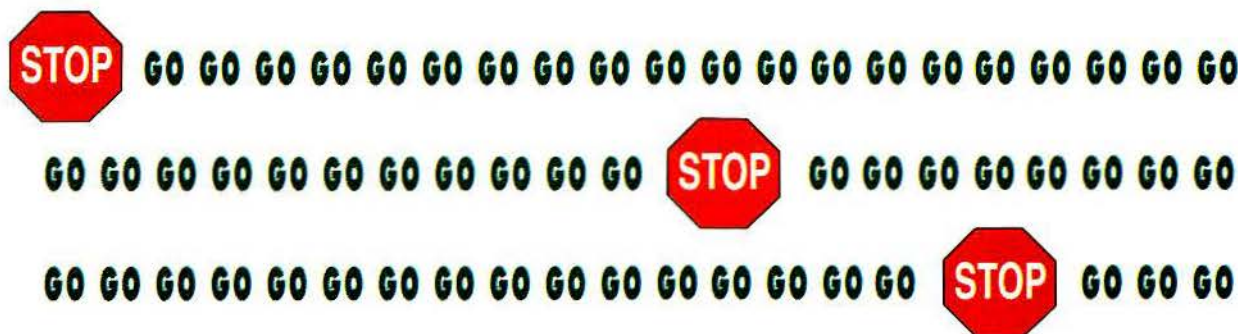
Figure 1. Instantaneous signal strength for a heavy urban environment.



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**Table 1. Additional power requirements for fading environments.**

Environment:	Additional Margin:
Heavy urban	15dB-20dB
Hilly terrain	12dB-15dB
Rural/suburban	10dB-12dB

identify problem areas, consider the instantaneous carrier to adjacent-channel power ratio, not just the ratio of the average powers. If you look only at the average signal levels and see a 30dB differential, you are likely to assume a good performance. This is especially true if the pager specifies 50dB of adjacent-channel rejection. Unfortunately, this is not a good assumption in an environment subject to significant levels of fading.

In a typical urban environment, ratios as small as 25dB can show noticeable reductions in paging reliability because the adjacent channel transmitter is likely to be close to the user, and not fading any appreciable amount; whereas the

desired transmitter is some distance away with the possibility of experiencing significant signal level fades. As a general rule, the pager's adjacent-channel rejection specification should be derated by the typical fading margin for the given environment.

#### Co-channel interference

The designer must also contend with co-channel interference, resulting from intermodulation products, or from a distant transmitter in the same system. When the interference originates from a transmitter in the same system, it is normally a simulcast delay spread issue, which is discussed in more detail below. Co-channel interference, from an uncorrelated source, has the same effect as raising the noise floor in the system. Thus, additional power is required to achieve the same level of performance that would be seen without the interference. It may seem as if a viable solution would be to raise the signal level in the affected area. Unfortunately, things are not that simple. Increasing the signal level in the affected area may cause interference at other sites, presenting the

designer with a "Catch-22."

Normally, if the offending signal is more than 25dB below the level of the desired carrier, it can be safely ignored. Levels in the range of 10dB to 20dB below the desired carrier can have a significant effect on performance, especially as signal levels approach the sensitivity threshold of the pager. If co-channel signals are within 10dB of the desired carrier, they probably come from a distant transmitter in the same system. In this case they are best modeled as a simulcast delay spread problem.

#### Simulcast delay spread

Simulcast delay spread (SDS) is also a form of co-channel interference, but it has some unique qualities. Although the two signals arriving at the pager contain the same data, they can interfere with each other because of the time delay between them. If the time delay is a significant portion of the symbol period, the effect can drastically reduce paging reliability. This is especially true in high-speed paging where the effective symbol width is significantly reduced compared to the older, low-speed formats. This places

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tighter delay constraints on the system design. A general rule has been to limit the maximum differential delay to one quarter of a symbol period. This is only a rule of thumb and should not be used as a design guideline. We recommend that the designer limit differential delays to the range of 15% to 20% of a symbol period when planning a system. This corresponds to laboratory test results, as well as to actual field measurements, which indicate maximum delays in the range of 50 $\mu$ s to 60 $\mu$ s for Flex 6400. Figure 2 at the right shows the effect of a delayed signal on the error rate as a function of the signal level differential and time delay. As the difference in power between the two signals is decreased, the level of distortion is dramatically increased. The data represent the average response for a group of randomly selected numeric and alphanumeric Flex pagers operating at 6,400bps.

When a propagation analysis tool is used to predict potential SDS areas, a "capture window" of 10dB should be employed. This window size helps to account for both the variability of the signal level predictions made by the analy-

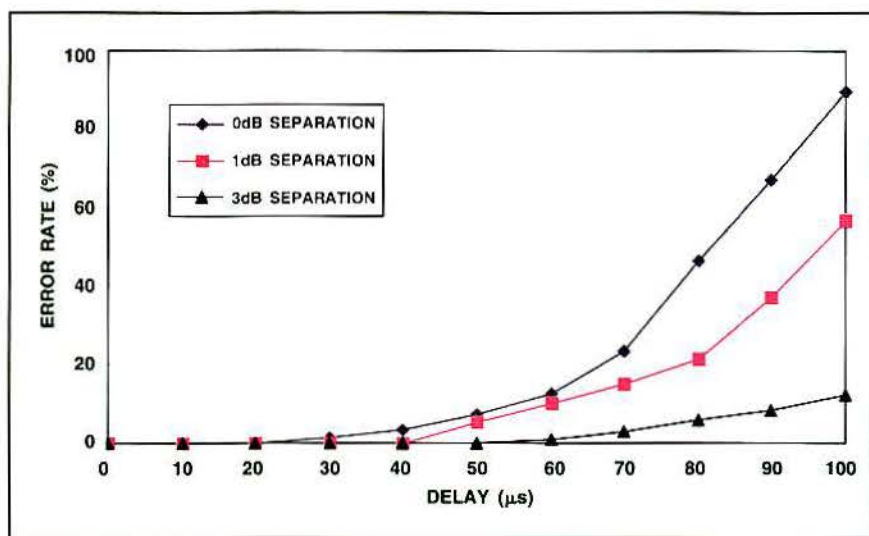


Figure 2. Probability of getting a corrupted 10-digit numeric page.

sis tool and for the non-uniform nature of the pager's antenna pattern when in close proximity to the human body. Wider capture windows can be used, but they tend to overstate the potential SDS problems unless the pager is

operating close to its sensitivity threshold.

#### Frequency offsets

When planning a system, the designer should always consider the use of

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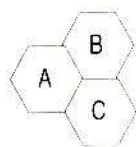
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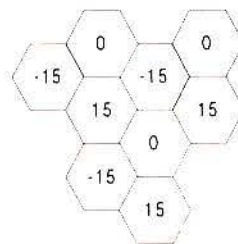
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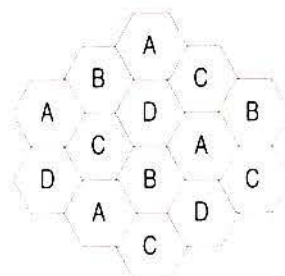
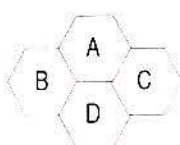
## THREE-CELL FREQUENCY REUSE [ -15 0 15 ] or [ -35 0 35 ] or [ -45 0 45 ] Hz



After choosing an offset scheme, assign the appropriate frequency to each transmitter in a cellular reuse fashion. For example if you wish to use the [ -15 0 15 ] Hz pattern in a nine-site system, you would end up with a layout as shown to the right: A = -15 Hz, B = 0 Hz and C = 15 Hz



## FOUR-CELL FREQUENCY REUSE [ -15 0 15 30 ] or [ -35 0 35 70 ] Hz



## SEVEN-CELL FREQUENCY REUSE [ -45 -30 -15 0 15 30 45 ] Hz

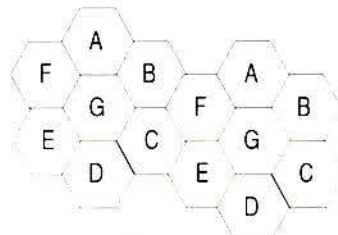
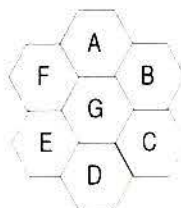


Figure 3. Offset frequency reuse patterns.

frequency offsets. An offset scheme does not solve every problem in a simulcast situation, but if properly implemented, it can help the designer to squeeze the last few percent out of the system. In laboratory tests, almost any offset frequency scheme outperformed the zero or no offset case. Field tests with frequency offsets have also shown definite performance improvements in a number of situations. There were no cases in which a performance degradation was observed due to the addition of frequency offsets in the system. Therefore, a carefully chosen frequency offset scheme can only help system performance.

The POCSAG protocol performs best with offsets in the range of  $1/3$  to  $1/2$  of the symbol rate. Most POCSAG systems incorporate offset values between 200Hz and 800Hz to maximize performance

while maintaining compliance with the FCC mask. The Flex family of protocols, on the other hand, performs much better with offsets less than 100Hz. With Flex, as with any interleaved format, the designer must be careful of the exact offsets chosen. In the range between 0Hz and 100Hz, both optimal and sub-optimal offset choices exist. Offset differences that are sub-multiples of 400Hz, (20Hz, 25Hz, 40Hz, 50Hz, 80Hz and 100Hz), tend to perform poorly and should be avoided. On the other hand, offset differences such as 15Hz, 30Hz, 35Hz, 45Hz, 60Hz, 70Hz and 90Hz work well and can reduce the error rate considerably. These offsets are valid for all Flex operating speeds. Figure 3 above provides a set of recommended offset strategies that can be applied to new or existing Flex systems. The offsets have been selected to maintain an optimum





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stability are necessary  
for the successful  
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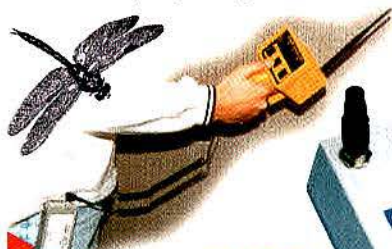
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frequency differential between all transmitters in the given cell pattern.

The offset values presented have an average bound of 1Hz. This means that an offset frequency within 1Hz of the given value will have almost identical performance. However, if the frequency is shifted two or more Hertz away from the given value, significant changes in the error rate can occur. This effect is most evident when moving away from non-optimum offsets. This implies that transmitters with good frequency stability are necessary for the successful deployment of static frequency offsets.

For larger systems, the complexity associated with implementing a specific offset scheme may be prohibitive. In these circumstances, the use of an automated, random offset technique may be pre-

ferred. Glenayre has developed a system that introduces, and periodically updates, a random frequency offset in each transmitter. This approach allows the effective use of offsets without the necessity for extensive bookkeeping.

### Conclusion

Several mechanisms can produce increased error rates in modern high-speed paging systems. Suggested guidelines have been given for fading margin, allowable adjacent channel and co-channel signal levels, maximum differential delay, and optimal frequency offset strategies. These guidelines will allow the wireless messaging carrier to optimize the design and operation of high-speed paging systems with greater understanding and success.

### References

- Hess, G., *Land-Mobile Radio System Engineering*, Artech House, Massachusetts, 1993.  
Rappaport, T., *Wireless Communications Principles & Practice*, IEEE Press, New Jersey, 1996.  
Williams, L., "System Integration of the Flex Paging Protocol," *Mobile Radio Technology*, June 1996.





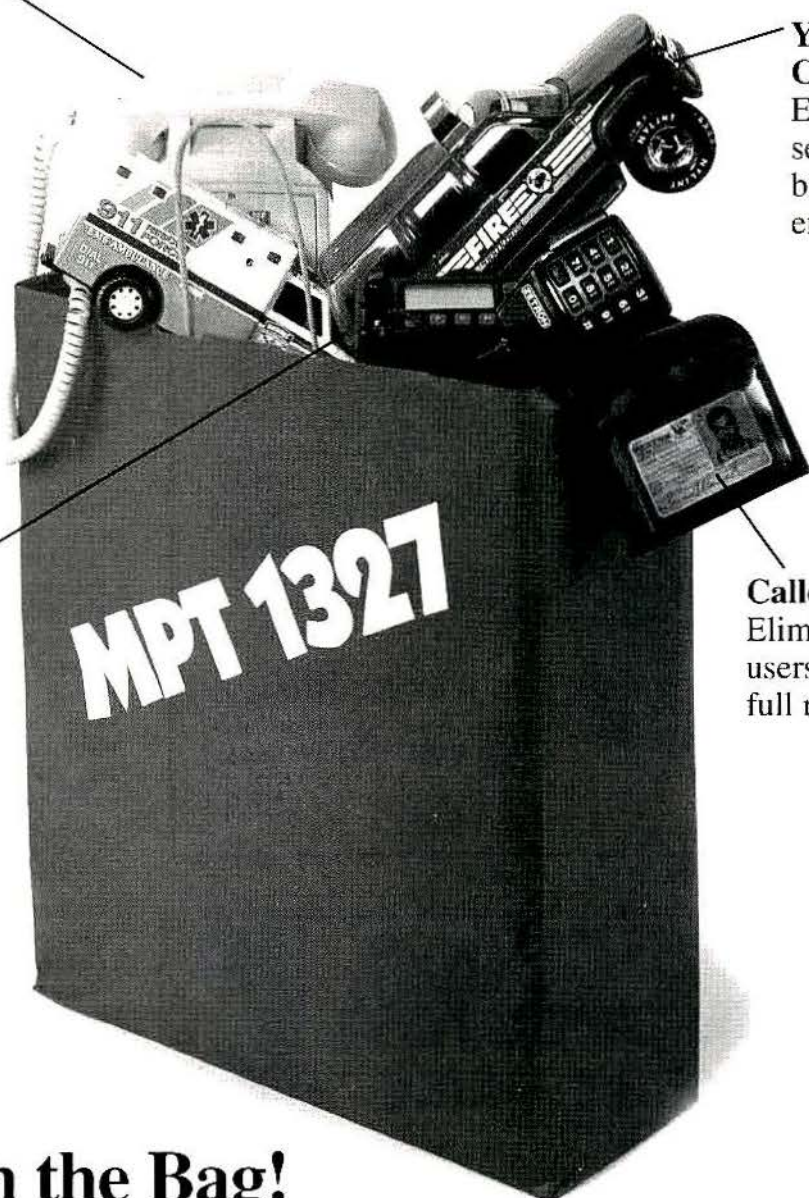
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## Technically speaking

(continued from page 8)

serious damage from the over-voltage condition before the power could be removed. Over-voltage conditions are often handled by a *crowbar* circuit that blows the power supply fuse when the output voltage exceeds a preset threshold. It happens in the blink of an eye, preferably before any damage to the device under test can occur.

Current limiting is another important

feature of the power supply. Generally, the current limiting control is adjusted to supply the needed amount of current to the device under test, but not much more. If the current requirement of the DUT exceeds this level, then the power supply goes into a *foldback* condition and limits the current to the preset level.

### RF immunity

Power supplies that are used in servic-

ing communication equipment such as transmitters must be able to operate in an RF field without adversely affecting the operation of the power supply. This is one of the most important factors when choosing a power supply suitable for testing communication equipment. Here, the specifications are rather arbitrary. For example, a specification might read "RFI resistant" or "No deterioration of performance when power supply is subjected to an RF field". Exact field intensity levels, such as microvolts per meter, would allow better comparison of power supplies for the RF immunity factor.

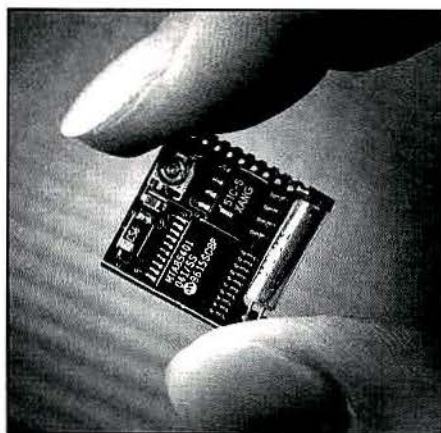
### Duty cycle

There are two specifications concerning duty cycle—*continuous* duty and *intermittent* duty. Continuous duty is easy to understand. It is virtually *all the time*. For example, if a power supply is rated at 20A continuous duty it can be operated at a load current of 20A 24 hours per day, seven days per week.

On the other hand, if a power supply is rated at 30A intermittent duty, what does "intermittent" mean? This must be spelled out in the manufacturer's specifications. For example, one manufacturer states "transmit duty 20 minutes, 20% duty." This indicates that the supply can deliver at the intermittent level for four minutes out of a 20-minute period.

There is also the ICS duty. This stands for *intermittent communications service*, where the intermittent service is on a 50% duty cycle or five minutes on and five minutes off. For example, a power supply may be rated for 15A continuous duty or 20A ICS.

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### Summary

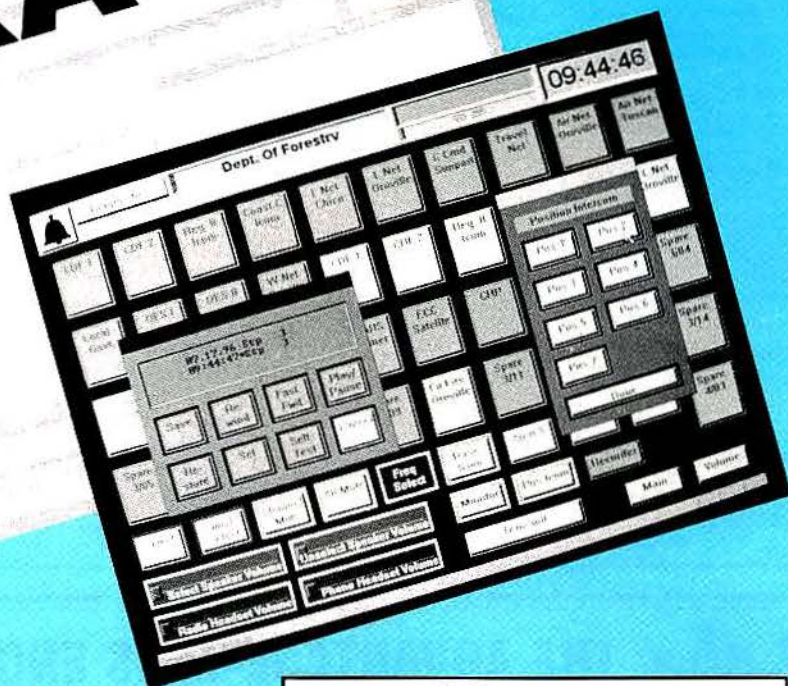
Sometimes, not as much care is put into the choice of the bench power supply as the other test equipment on the bench. The power supply should be one of the most important considerations of all the bench test equipment. It is used in virtually every test procedure requiring dc power on the bench. If you are working from a poor-quality dc bench supply, you are asking for trouble. Shortcomings with the power supply can lead you on a wild-goose chase. The trouble might appear to be in the equipment when the power supply is the real culprit. Good dc power supplies are not terribly expensive, considering that they are the workhorses of the test bench. Carefully compare manufacturers' specifications and get the best power supply your budget will allow.

Until next time—stay tuned!





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## Product/services showcase

The following pages contain mobile radio, paging and cellular products and services of advertisers in this issue. Information is provided by the advertisers. For more information on these products, circle the corresponding Fast Fact number found on the card on page 73. Also, refer to the Advertiser Index on page 72 for the page reference to the company's advertisement.



### Antenna and cable analyzers

AEA has developed a full line of low-cost antenna and TDR cable analyzers. Each hand-held test instrument features a graphic display in a rugged plastic package.

Check the Web site at [www.aea-wireless.com](http://www.aea-wireless.com).

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### Transmission cable

The 5/8" LDF4.5-50 Heliax cable from Andrew is a transmission line for wireless applications where high performance and cost-effectiveness are key concerns. Also appropriate for shorter cable runs where low attenuation is still important, the cable features low-loss foam dielectric, a solid center conductor and a solid copper corrugated outer conductor.

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### Portable power meter

Anritsu's ML2430A series of power meters combine the advantages of thermal-based meters, diode-based CW meters and diode-based peak power meters. Sensors are available from 10MHz to 50MHz for this battery-powered instrument.

Call 408-778-2000 for more information.

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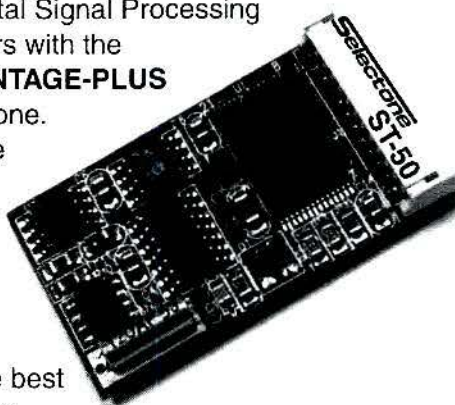
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### NiMH battery

**Battery Network** announces a new 1,800mAh NiMH battery for the Motorola Astro Saber two-way radio. Now available for immediate delivery, the BN8251-XT battery is designed for power and duty cycle requirements. A battery eliminator and charger and conditioner are also available.

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### Class A transmitters

Gator transmitters from **Berkeley Varitronics Systems** are designed for measuring signal propagation, positioning antennas, setting power levels or validating coverage. Transmitters are available in a variety of frequencies with either 25W class A or 45W class A models (10W or 20W class A for PCS models). They are FCC-type accepted and available from stock.

Circle (405) on Fast Fact Card



### Automatic numbering identification system

The ANI (automatic numbering identification system) from **Communications Specialists** identifies users on a radio channel. The data rate is 37ms per tone, EIA five-tone protocol. The ANI-1 encoder measures 1.13" x .66" x .22" with connector. The ID and status messages can be decoded and displayed on a computer using the ANI-2 station decoder.

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### Coaxial cable

**Cell Reach** high-performance, low-loss, 50Ω coaxial cables are designed for

wireless transmission systems. The cables from **CommScope** combine a smooth-wall copper outer conductor and a high-strength, closed micro-cell foam dielectric. The cable is triple-bonded to provide electrical and mechanical stability and low VSWR, and eliminate water migration.

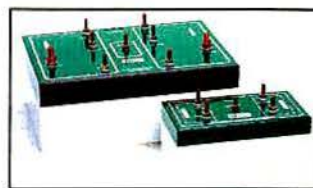
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### Repeater controller

**Connect Systems** announces a new repeater controller with duplex interconnect designed for private systems that require a desktop style repeater with full or half-duplex interconnect. Designated as model 8300D, this controller accepts overriding to selectively call mobiles or portables using DTMF, CTCSS, DCS, two-tone or 5/6 tone formats. The 8300 can be programmed over the air using DTMF, from any DTMF telephone or any DTMF phone plugged into the PROG jack.

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### Suppressor, filter

**Cutler Hammer's** Aegis+ is a cost-effective "two-stage" hybrid series ac suppressor and filter designed exclusively for telecommunications OEM applications. With a small footprint, Aegis+ is suitable for PCS or cellular facilities where space is a premium.

Call 403-259-3200 for more information.

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### Desktop power supply

The **DuraComm** DTB-12 desktop uninterruptible power supply is a compact dc unit that automatically switches to the built-in battery when the ac fails. The built-in sealed gel cell delivers 12V at 7Ah when the ac mains fail. The supply has a low profile with a strong, extruded aluminum chassis.

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### Computerized catalog

The **Hutton Communications** AccessLink (HAL) gives customers access through their personal computers to products from more than 100 wireless communications manufacturers. In addition to being a computerized catalog, HAL allows customers to create an order and transmit it to Hutton while confirming product pricing and availability.

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### Base station power supply

The **ICT** base station series are custom-designed to fit selected models of E.F. Johnson, Ericsson, GE, Kenwood, Maxon, Midland, Motorola, Standard, Tait, Uniden and Vertex. The combination provides the user with a sleek, compact, custom mobile radio base station. The ICT base station covers may be sold separately or purchased as a complete unit.

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### Dispatch networking

Low-cost dispatch networking of LTR format from **IDA** is now available. Net-link with Word Saver is simple and convenient for customers. No microwave, phone lines or signaling are needed.

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### Desksets, adapters

**GAI-Tronics Instrument Associates** Division announces a new feature-packed line of local and tone desksets, adapters, interconnects and repeaters controllers. GAI has been designing and private-labeling products for 25 years.

Call 901-947-4000 for more information.

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### Consoles, workstations

**Modular Communication System's** consoles and stand-alone dispatcher workstations include the Ultra-Com PRO, which features "Screenmaker" and "Customizer" programs allowing the user to modify screens for specific requirements.

Circle (415) on Fast Fact Card



### Test receiver

The Xplorer test receiver from **Optoelectronics** is suitable for radio quick checks. You can determine frequency, signal strength, deviation, CTCSS, DCS, DTMF and now LTR. LTR decoding includes area code, home repeater, user ID and correct repeater ID estimate.

Call 954-771-2050 for further information.

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### Dispatch console

The Calida+ from **Orbacom Systems** is the single-position (with as many as four positions in parallel), module for dispatch control centers. Orbacom uses analog technology and a practical design for consoles in all of its communications center products.

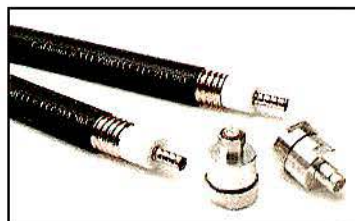
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### Lightning and surge protection

**Poly-Phaser** introduces the next generation in lightning and surge protection for the rapidly growing personal communications services market with its patent-pending Micro PSX series.



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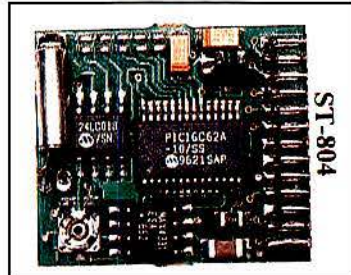


### Coaxial cable

With the addition of the 2 1/4" size, **RFS Cablewave's** coaxial transmission line is now available in all sizes for wireless transmission systems, from 3/8" to 2 1/4".

Call 203-239-3311 for further information.

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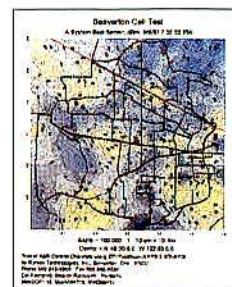
### ANI encoder

The new ST-804 sub-miniature DTMF ANI encoder from **Selectone** is designed for unit identification for two-radio applications, as well as remote control and remote equipment status reporting.

www.selectone.com

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### Signal measurement



**Survey Technologies** introduces mobile signal measurement and coverage analysis systems for AMPS, GSM, TACS, IDEN, SMR, ESMR and NAMPS wireless networks. The STI-9100 places the complete set of measurement and analysis tools in the hands of the field engineer to increase efficiency.

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### Weather radio

**Thunder Eagle's** Weather Eagle 300 automatically places weather alerts on a two-way radio system, voice mail or pager. The radio digitally records and day-and-time stamps each alert message. The radio is suitable for EOCs and mobile units.

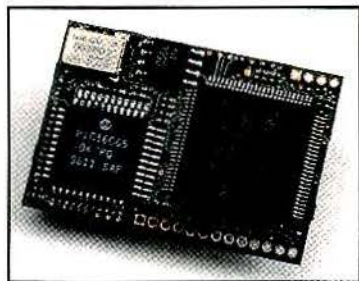
Circle (422) on Fast Fact Card



### Cable installation accessories

**Times Microwave Systems'** line of installation accessories are for use with LMR-600, 900, 1200 and 1700 flexible communications cables. The accessories include blocks, adapters, brackets, inserts and mounting accessories.

Circle (423) on Fast Fact Card



### Encryption module

**Transcrypt's** SC20-DES encryption module uses up-to-date voice technology to encrypt digitized audio using the DES algorithm. The SC20-DES transmits encrypted voice, which is indecipherable by virtually all listeners.

Circle (424) on Fast Fact Card



### SMR combiner

This new **TX RX 851-869** airline junction multicoupler features high-power square cavity design coupled with low-loss, ultra-flexible, airline technology. Airline technology eliminates the need for cable changes when retuning channels. For more information, call 716-549-4700.

Circle (425) on Fast Fact Card



### Remote console

**Vega Signaling Products'** dial-up remote console, model C-550, and remote station panel, model RP-251, offer a way to remotely control a base station over a public dial-up telephone line. The system provides a backup way of remote station control in the event of leased-line or microwave-link failure.

Circle (426) on Fast Fact Card



### Mobile transceivers

The VX-3000 series land mobile transceivers from **Vertex Radio Communications** are available in 70W lowband, 50W VHF and 40W UHF. Each model meets FCC part 90 requirements and offers complete flexibility in programming narrowband and wideband on a per-channel basis.

Circle (427) on Fast Fact Card



### RF power amplifier

Designed for use in conjunction with 900MHz radio modems, this half-duplex modem-compatible RF power amplifier from **VoCom** features TX/RX switching times of 25µS or better, as much as 25W output with as little as 200mW input, 13.8Vdc operation and adjustable output power to maximize efficiency.

Circle (428) on Fast Fact Card



### Dispatch modules

Upgrade emergency telephone center systems without replacing the entire system. **Zetron's** modular dispatch telephone products include an instant recall recorder, TDD with 24-column mini-printer, caller-ID system for seven-digit lines and a flexible telephone console.

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## No crystal ball required

By Robert H. Schwaninger Jr.

It's Nov. 17, and the 800MHz auction rages on in all of its 1-900 hotline fury with players jockeying for position in a final-stretch run. The horses have been out of the gate for three weeks, and this one ain't gonna be a photo finish. Nextel Communications, McLean, VA, is going to win by about 475 furlongs. If you're into suspense, try watching paint dry. It's more eventful.

Prior to the auction, everyone except the FCC was calling this auction "a lock," "wired" and "a farce." Only the FCC was promising surprises and steadfastly clung to its belief that the auction would wind up being competitive. The auction isn't over, but the FCC's predictions have turned out to be about as accurate as the 1948 headline "Dewey Wins."

Schwaninger, MRT's regulatory consultant, is a partner in the law firm of Brown and Schwaninger, Washington, DC. He is a member of the Radio Club of America.

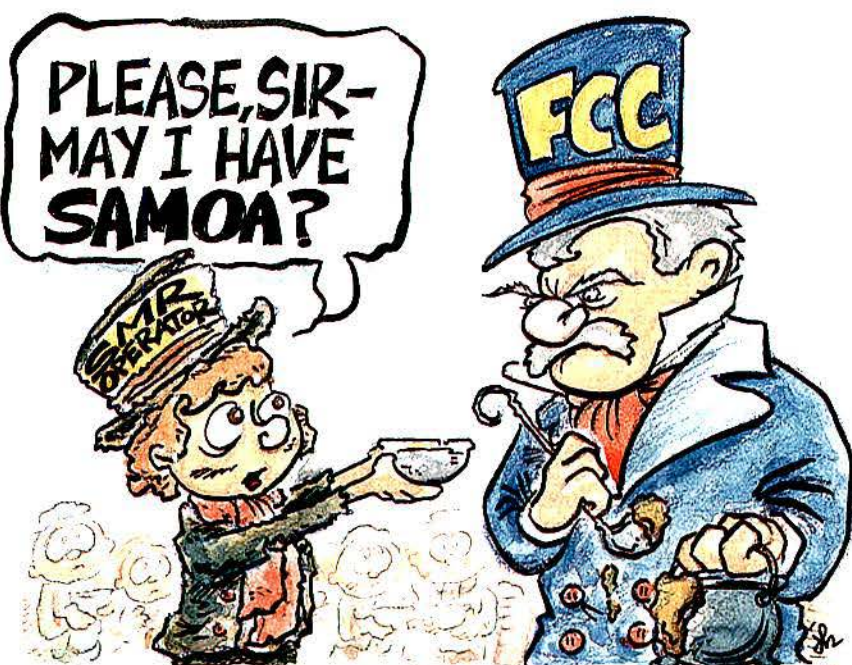


ILLUSTRATION BY JOHN HAYES

Based on the "exit polls" in this auction, the participants have all but given over at least 80% of the available spectrum to

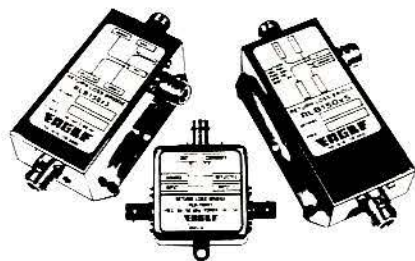
Nextel. Although originally there were about 90 applicants, the number shrank by a third before the bidding even began. Within two weeks of starting the auction, the original number was cut in half. At this stage, only 21 active bidders remain, with Nextel posting high bids on 474 out of 525 markets. If this were a prize fight, the referee would have stopped it. Observers have noted that the only markets Nextel doesn't seem determined to snatch up are Guam and American Samoa, if any SMR operators want to move West—way West.

If this auction continues the way that it has (and there is no reason to expect any upset), Nextel will be handed a temporary triumph over the FCC's claim of a competitive auction. The FCC's obligation to cause the dissemination of licenses among various applicants, including small business, rural telephone companies and other designated entities, will simply not be met. Instead, this auction will demonstrate that every claim made by every opponent of the auction was correct.

That this auction is simply silly is demonstrated by the numbers. Whereas Nextel is the high bidder for spectrum that allegedly will serve more than 720 million pops. (population is counted twice for overlapping areas), the next highest competitor at this time is Southern Company, Atlanta, covering around 9 million pops. So the difference between number one and number two in the auction is about 80 to 1.

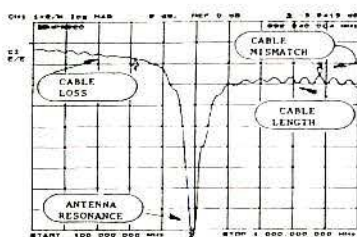
Some misguided people have claimed that Nextel is attempting to gain a monopoly within the 800MHz SMR

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Circle (30) on Fast Fact Card



## Regulating technology

market. Even the U.S. Department of Justice was concerned about overconcentration of the dispatch market, and that was based solely on Nextel's holdings about three years ago. So what can we say now? Can we fairly state that Nextel's reward from this auction will result in a more competitive or less competitive environment?

Nextel claims that the auction will result in greater competition, citing its efforts to compete with cellular and PCS carriers. But is this conclusion correct if, by awarding nearly all of the available spectrum to Nextel, the FCC stifles the competitiveness of the remainder of the SMR market?

On one hand, the FCC has claimed that traditional SMR operations are fully competitive with common carriers, such as cellular and PCS, for the purpose of designating those systems as Commercial Mobile Radio Service (CMRS) and for the collection of Universal Service fees. On the other hand, the FCC has claimed that traditional SMR is not competitive with cellular and PCS—and that only by geographic licensing will this competition be realized. One or both of the agency's

claims are incorrect.

As of mid-November, a number of parties have appealed the FCC Orders that created the 800MHz SMR auctions, and these appeals have been consolidated under one case, *Fresno Mobile Radio Inc. et al v. FCC*. I am proud to say that my firm represents the Fresno appellants. We will zealously bring forth our argument with a reasonable expectation that the U.S. Court of Appeals, with no ax to grind or political agenda to forward, will carefully review the FCC Orders and will find that this auction does not comport with law.

At this writing, we have not received a briefing schedule from the court, but we expect that our brief will probably be due soon after the beginning of the year. By that time, this auction should be over, with Nextel standing atop a stack of new geographic licenses that towers over its closest competitor. Whether Nextel gets to keep them will be decided by the court.

This time lag brings up a great opportunity for the FCC. We have new commissioners, new bureau staff and a new general counsel. These new public servants are not irretrievably tied to the decisions of the old commissioners. So, how about

something truly novel? What if the new commissioners were to look over the results of this auction and see that maybe, just perhaps, it didn't turn out well? Could they throw it out? The answer is yes.

Should they toss out the auction results? Yes. By simply canceling the results of the auction, the FCC would demonstrate that it has the integrity to admit that it simply miscalculated. It could show that it truly did not intend that nearly all of the licenses would become the property of a single entity. It could show that it does care about designated entities, fundamental fairness and doing what the Communications Act says that it ought to do.

In a perfect world, the FCC would toss out the auction and make moot the appeals of the court. In a perfect world, there would have been no auction in the first place. In a perfect world, I'd be out of a job. But then, it's a job I've never really liked. For all of my glib comments, I'd give up my role of the loyal opposition, just to get an FCC that cares about mom-and-pop shops, that follows its own rules and that manages the radio spectrum. Maybe this new commission will surprise me. Heaven knows, this auction hasn't.



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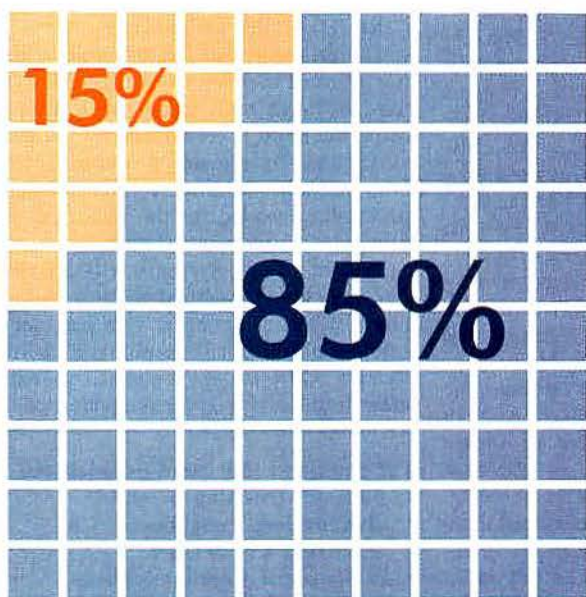
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## New trunking protocol for wide-area dispatch networking draws support from several radio manufacturers

In a show of industry unity, companies that would otherwise be seen as competitors in the SMR marketplace have agreed to adopt a common enhanced trunking protocol to succeed the LTR format. The announcement was made at the AMTEX '97 conference in Orlando, FL, on Nov. 6, 1997.

The Passport NTS trunking protocol, developed by Trident Micro Systems,

Arden, NC, supports wide-area networking and seamless roaming between networked sites with automatic registration and de-registration for user radios. The protocol features selective calling, telephone interconnect and security from theft, and it is backward compatible with LTR.

Passport supports a dual-protocol operating environment, which simplifies the migration path for radio users and opera-

tors who are upgrading existing systems.

Passport radios use direct frequency assignment to determine their operating frequency. The assignments are made over-the-air by the system infrastructure. Changes in the system or network configurations do not require that all radios using a given system be reprogrammed, such as with the standard LTR operating environment.

The protocol is an enhanced version, supporting 60,000 individual user ID codes per system and 7.5 million roamer ID codes per network. The amount of user ID codes is the yield from the mobile identity number (MIN) and group IDs (GRP-ID), 16-bit assignments.

The protocol also features auto registration when roaming from system to system. Because each radio has a unique MIN, the radio is recognized by the new system and is registered automatically onto the network. Dispatch and interconnect calls intended for the radio will be forwarded to its new location.

Trident Micro Systems will provide free licenses to qualified radio manufacturers. Rhett Grotzinger, vice president, said, "This protocol is going to allow today's SMR to stay competitive with other forms of wireless communications."

## Anritsu 'globalization' strategy will link worldwide services, products

Tokyo-based Anritsu has announced a "globalization" strategy to link the operations, technologies, products and services of the company's 54 worldwide locations. Enhanced product development, responsive customer service and improved distribution are among the objectives.

The strategy was unveiled at a September news conference in Jersey City, NJ.

"This strategy stresses our new motto, 'A global company with a local face,'" said Anritsu chairman Yoshiteru Ishii.

"The benefit of the strategy is quick response to customer needs and the confidence that comes from dealing with a company that can apply global resources to local business and market conditions," Ishii said.

Mark Evans, president of the company's North American Measurements Group in Morgan Hill, CA, explained that Anritsu uses local engineering groups to boost responsiveness to individual customer requirements. "At the division level, equipment designers look at the overall market," he explained. "Local engineering groups help us to meet specific customer requirements that might



Company chairman Yoshiteru Ishii calls Anritsu 'a global company with a local face.'

not be 'designed in' at the division level."

Evans' group includes three divisions, Microwave Measurements, Telecommunications and Anritsu Manufacturing. The

group previously was called Anritsu Wiltron. Wiltron was acquired by Anritsu in 1990. As an example of the new strategy's global concurrent engineering, Evans' group already has developed three products with sister organizations in Japan and England, the MT8801B radio communications analyzer, the IS-136 option for the product, and the ML2430A-series power meters.

### Companies that have adopted the Passport trunking protocol:

- ☐ Kenwood, Long Beach, CA.
- ☐ Ritron, Carmel, IN.
- ☐ Standard Communications, Torrance, CA.
- ☐ SEA, Mountlake Terrace, WA.




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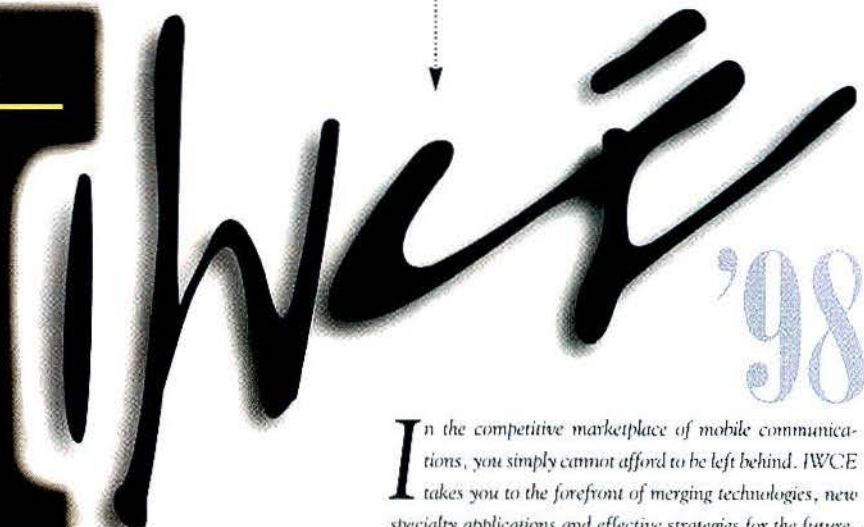
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## RAM Mobile Data offers industry-specific, 'entry-level' data dispatch

Field service, transportation, utility and cable TV companies can take advantage of a wireless data dispatch solution intended for entry-level use. The solution, from RAM Mobile Data, Woodbridge, NJ, includes dispatching software, communications hardware and wireless airtime service. The company operates a network of packet data base stations on specialized mobile radio (SMR) frequencies across the country.

The software has pre-defined message fields and free-form, two-way messaging with date-stamped message acknowledgments. The hardware is a palm-size, two-way wireless communications device, called an Interactive Pager, with a QWERTY keyboard. Airtime is provided on RAM's network.

Three industry-specific plans are:

- **Transportation—pick-up and delivery.** Pager rental and about 560 messages for \$65 per user, per month.

- **Computer and office automation field service—even management.** Pager rental and about 640 messages for \$70 per month.

- **Utility and cable TV field service—customer response.** Pager rental and about 800 messages for \$75 per month.

Using the cable TV industry as an example, here is what two companies currently use:

Jack Fulton, dispatcher and warehouse manager for American Telecasting of Toledo, OH, said his company uses a combination two-way radio, cellphone

and pager provided by Nextel Communications, McLean, VA. Although the field technician *can* use the cellphone feature to call the next customer scheduled for service, Fulton prefers that technicians use the two-way radio feature to call him, and then he calls the next customer. The procedure creates a useful record at the dispatch office and saves a cellphone airtime charge. Fulton can use the pager feature to alert an on-call technician and send alphanumeric text messages giving details about the required service.

Steve Metzger, master control technician for Time Warner-owned Paragon Cable, Portland, OR, said Paragon's private wireless system has two channels for voice and one channel for data. Technicians carry hand-held mobile data terminals that can be mounted in their trucks to connect with vehicle-mounted radios for wireless communications. A vehicle location system that uses the Global Positioning System plots truck locations on an electronic map for the dispatcher.

"We're trying to get signature capture so the customer's signature can appear in the system electronically," Metzger said. "We already have eliminated a lot of paperwork."

Klakkamas Communications, a dealer in Portland, handles some of the installation, maintenance and repair for the Paragon system, which has three repeaters, including one voting repeater with two satellite receivers and one repeater for data.

## Celwave and Raytheon E-Systems announce alliance for DSP sales

Celwave, Marlboro, NJ, and Raytheon E-Systems, Falls Church, VA, have agreed to a strategic alliance to sell Raytheon Precision Spectrum products digital signal processing platforms as an extension and enhancement of the

Celwave Smart System product line, and to jointly develop advanced, integrated versions of both product lines. The companies plan to demonstrate digital AMPS time-division multiple-access (TDMA) versions in the coming months.

## Chadmoore Wireless SMR service activations reach 125th market

Chadmoore Wireless Group, Las Vegas, activated specialized mobile radio (SMR) service in 45 additional markets throughout the United States in November 1997, raising the total number of markets to 125. The population base for those markets exceeds 35 million.

"Our strategy is to serve analog, one-to-many, dispatch communications, at a fixed cost to the small- and medium-size businesses in secondary and tertiary markets," said Jan Zwaik, chief operating officer. "Typically, these businesses cannot afford the \$70 per month, per unit, cost that other wireless providers charge for the latest 'gadgets and gadgets.' We believe our customers are telling us that they should be offered a choice of services and service providers to meet their business objectives."

## Glenayre offers paging agent program to service shops, dealers

Glenayre Technologies, Charlotte, NC, seeks two-way radio service shops and dealers to become sales agents for the company's paging transmitters and terminals. Phil Johnson, a Glenayre vice president in charge of the sales agent program, said that sophisticated dealers with experience representing Motorola, Ericsson and Johnson two-way radio equipment, among others, have the expertise to install and service on-premises paging systems. He said many customers base equipment choices on local service, not branding.

By offering an agent program for service shops, Glenayre can target non-traditional customers such as hospitals, government agencies and industrial complexes. In turn, sales agents gain access to the company's technical and sales forces.

For information about the program, telephone Johnson at 704-553-0038.

## Gabriel Electronics relocates eastern region sales office

Gabriel Electronics has relocated its Eastern Region Sales Office from Hagerstown, MD, to Camp Hill, PA.

The new address for Gabriel's Camp Hill complex is: Gabriel Electronics, 3920 Market St., Camp Hill, PA 17011; telephone 717-972-1295; fax 717-972-1297; email: [bpeckrul@compuserve.com](mailto:bpeckrul@compuserve.com).

Robert Peckrul manages Gabriel's eastern region sales operation that is responsible for accounts in New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, Georgia, Alabama, Mississippi and Florida.



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## Racal Antennas makes play for PCS base station antenna market

Racal Antennas, Mineral Wells, TX, a unit of Racal Electronics Group, Reading, Berkshire, UK, expects to launch a campaign perhaps in December 1997 or January 1998 involving a number of "special use" antennas for the personal communications systems (PCS) market.

Racal opened a \$2 million development and manufacturing site in Mineral Wells in August 1997 to supply PCS base station antennas. More than 25 people initially were employed at the facility, which began operating with a capacity of making about 2,000 antennas per month.

Tony Martin, vice president of marketing at Racal Antennas, explained that the company had not provided many antennas for the first phase of PCS system buildout, which he described as network construction intended to cover the cores of cities. "We're hoping the plant in Texas will allow us to be more aggressive," Martin said, referring to providing antennas for phase-two PCS network construction that includes suburbs and highway corridors.

Martin explained that PCS carriers increasingly are using dual-slant polariza-

tion antennas, a product that Racal helped to pioneer in Europe about six years ago. He estimated that as many as eight companies now offer that type of antenna.

Dual-slant polarization uses antenna elements slanted at 45° angles from the vertical, forming two antennas within one radome, which reduces installation size and cost by about 50%, Martin explained. He estimated that perhaps 10%-15% of PCS network engineers still use vertically polarized antennas, but, he said, "Most everyone has bought into dual-slant polarization. The use really is driven by zoning issues. It is much easier to get dual-slant antennas accepted. Vertical polarization typically uses a tower with a delta at top and two or three antennas on each side of the delta. Dual-slant shrinks that down to one antenna per side."

Martin said the PCS base antenna market is particularly good because of the density of base station placement, which he said is at least three times denser than cellular and often even denser than that. The reason is the higher frequency and lower power used by PCS compared to cellular.

## Ericsson PRS transfers some employees, lays off others

Ericsson Private Radio Systems (PRS), Lynchburg, VA, a division of LM Ericsson, Stockholm, notified an estimated 270 workers in September 1997 that some would be transferred to the company's Wireless division and others would be laid off. Ralph Brush, director, Business Development and Strategic Programs at the private radio division, said about 70% of 170 full-time Ericsson employees were likely to be transferred to the Wireless division, which manufactures cellular and personal communications service (PCS) handsets and base station equipment. Continuing work at Ericsson for 100 part-time employees and contractors is uncertain.

"We have staffed up over the past five years heavily," Brush said. "Because of Project 25, TETRA, and deregulation of the investor-owned utility companies, our orders rate is not what we expected it to be. Uncertainty and delays connected with Project 25, TETRA and deregulation are causing postponements in orders." Project 25 is the U.S. digital radio standard-setting effort for public safety radio; TETRA (Trans-European Trunked Radio) is a similar European effort for public safety and private digital mobile radio. Consideration of TETRA as a possible additional U.S. standard has added to the uncertainty. Among utility companies, deregulated electric utilities in particular are undergo-

ing changes, including mergers and sales of power generation facilities, that delay their long-term plans.

Employment at Ericsson's Lynchburg, VA, facility rose from about 1,600 in 1993 to about 3,000 in 1997, largely because manufacturing has increased for cellular handsets and cellular and PCS base stations that use the AMPS and D-AMPS standards. Ericsson makes all of its AMPS and D-AMPS equipment in Lynchburg for worldwide delivery. With sales of such equipment rising rapidly, Brush said the company is fortunate to be able to transfer many of the PRS division employees to the Wireless division.

"We're fortunate to have contractual businesses," he said. "We think the private radio business will come back." Brush said that Ericsson PRS sales mostly consist of trunked dispatch systems. "That's where our expertise is," he said, "especially the multisite and simulcast systems. We're seeing more activity internationally, now, than in North America. We're trying to take advantage of that."

Sales of Ericsson's conventional two-way radio product line play no role in the Lynchburg transfers and layoffs because, with the exception of a "high-end public safety product" that could be used in a conventional mode, all of those products are manufactured offshore.

## Midland, Roamer One announce partnership for 220MHz service

A partnership to combine hardware, network services and wireless channel access at 220MHz was announced in November 1997 by Roamer One, Torrance, CA, and Midland USA, Kansas City, MO. The two companies are subsidiaries of Intek Diversified, Princeton, NJ.

Roamer One operates 220MHz networks, specialized mobile radio (SMR) repeaters and sells equipment and airtime. The company operates more than 1,300 channels in 127 U.S. cities with a population coverage of about 165 million. Midland USA, primarily noted for its distribution network, dealer sales and support of FM two-way radio equipment, is increasing its involvement in the SMR market. The partnership will package Roamer One's airtime service network with Midland USA's linear modulation (LM) narrowband trunked voice and data mobile equipment. Software support comes from Data Express, Garden Grove, CA.

The alliance was announced in a four-state demonstration tour for prospective end-users and dealers. The airtime service is available for a flat monthly rate, as opposed to enhanced specialized mobile radio (ESMR) and cellular programs that charge a base rate plus minutes used. The first four markets for the program will be Los Angeles, Phoenix-Tucson, Minneapolis and Kansas City, MO. Two more markets, Cleveland and Buffalo, NY, will be added in January, said Scott Henderson, Roamer One's vice president of sales and marketing.

"Together, we are able to develop reliable, cost-effective integrated voice and data solutions that will create new possibilities for construction, courier, local trucking, delivery, taxi and a variety of other service business applications," Henderson said.

The LM technology, acquired by Intek Diversified in 1996, can transmit digital, analog, voice data and graphics all in 5kHz of bandwidth. The system's digital capability offers improved audio clarity, text messaging, computer-aided dispatch and automatic vehicle location. The software can also generate reports and recreate routes traveled by a vehicle.

Kevin Burke, of Data Express, told prospective users during the demonstrations that return on investment was a key aspect of the program. "We believe we can save up to one hour per day per employee in productivity," Burke said, representing a savings of as much as \$6,500 per year per employee.





## Trunking portables meet military specifications

The TK-480 and 481 (800MHz and 900MHz) hand-holds from **Kenwood Communications** have die-cast aluminum chassis, compact cases, weather seal gaskets and meet MIL-STD 810C, D and E. When the KMC-25 Milspec speaker microphone is attached to the radios, it meets the same military standard performance specifications. The radios include spring-action, gold-alloy elements for the universal accessory connector and battery contacts, which improve contact, conductivity and anti-corrosive properties. The radios have a polyvinyl keypad membrane and speaker cone for wet weather. They have large speakers, 500mW audio power and compander circuit (TK-481).

Circle (301) on Fast Fact Card

## AVL software features status messaging, management reporting

**Data Express'** version 3.0 of Fleet Management 2000 automatic vehicle location (AVL) software is Windows-based. It offers status messaging, management reporting and other customer-driven features for improving fleet management, productivity, customer service and driver safety. The software runs on an IBM-compatible PC. It uses real-time global positioning system (GPS) data transmitted from the vehicle to the base station over two-way radio to provide vehicle location, speed, direction, time and other measurements. This version supports intelligent vector maps, as well as scanned bitmaps. The software offers enhanced two-way messaging and management reporting capability, which enable fleet managers and dispatchers to use alarms, messages and reports generated by the software to manage vehicles and mobile employees. Daily activity of each vehicle is stored for future playback or archiving.

Circle (302) on Fast Fact Card

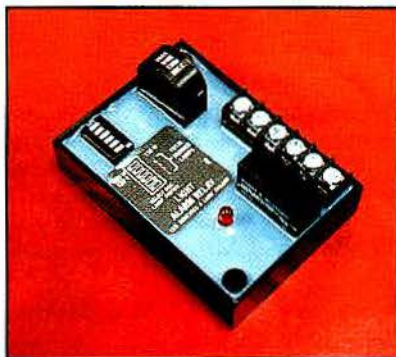


## Readers' choice

Of all the new products and services in the May 1997 issue, the one reprinted here generated the most reader requests for additional information. If you missed it the first time, here is your opportunity to acquire more information on it. Just circle the corresponding Fast Fact Card number on the card found in the back of this issue and mail the card to us.

## Lamp alarm relay meets most obstruction lighting requirements

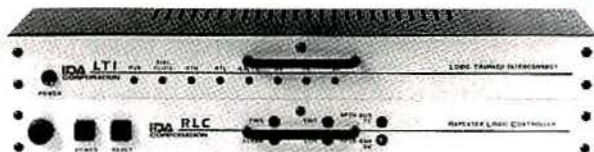
The SCR630T from **SSAC** is a universal electronic lamp alarm relay used to sense a lamp failure on radio and TV towers and other tall structures. One unit can be adjusted to meet most obstruction lighting requirements. The SCR630T will detect the loss of one lamp out of one, two, three or four lamps. As many as four 500W flashing beacons or as many as four 100W (116W) side lamps can be monitored with one unit. Selection of the number of lamps, wattage and their voltages is made via six switches on the unit. The SCR630T's toroidal transformer constantly monitors the current flowing in the lamps' wiring. When the current drops because of a lamp failure, the



SCR630T's LED lights and its output transfers. A trip delay is included to prevent nuisance tripping.

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## New products

### Spectrum analyzers add standard features and improved speed



With Anritsu's portable spectrum analyzers, the MS2650B and MS2660B series, the display update rate and the personal test automation (PTA) processing speed are 30% faster than previous models. The improved speed is due to an increase in the CPU clock to 16MHz and in the display

update rate clock to 6.4MHz. The MS2650B has a 9kHz-3GHz frequency range, and the MS2660B covers the 9kHz-8.1GHz range. Both instruments have standard functions that were previously only available as options. They feature built-in frequency counters, FM demodulation waveform displays, GPIB or parallel interfaces and memory card interfaces. Options now available with the series are reference crystal oscillators, narrow resolution bandwidths, high-speed time domain sweeps, trigger and gate circuits, AM and FM demodulators and voice monitors, preamplifiers, quasi-peak detectors, sweep signal outputs, TV monitors, dc couples inputs and tracking generators.

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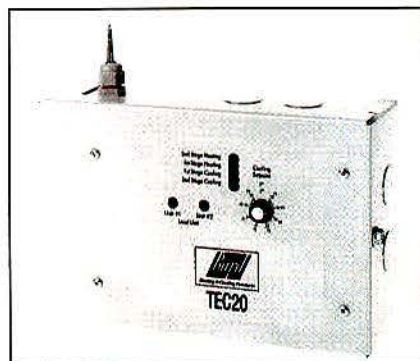
### PCS repeater for CDMA, TDMA, extends base station coverage

The R1900 cell-extender repeaters from Watkins-Johnson are for CDMA and TDMA systems. These over-the-air repeaters offer an economical way to extend base station coverage. They incorporate RF technology for channel selection and a high dynamic range for cell extension require-

ments. Standard 2W CDMA and 5W TDMA models are available in either single- or dual-channel configurations. Windows-based software allows a remote operator to monitor alarm information and control frequency channel and gain.

Circle (304) on Fast Fact Card

### Control alternates two air conditioners' operation



Bard Manufacturing's TEC20 electronic timer-based control switches the operating sequence of two wall-mount air conditioners on a 1-, 3-, 7-, 14- or 28-day schedule. The TEC20 is for air conditioning units with or without economizers. The TEC20 contains a two-stage cool and two-stage heat thermostat with a 4° differential between stages. LEDs indicate lead unit and powers from unit one or unit two. The control includes an isolation circuit that prevents back feeding or phasing problems. It is suitable for 50Hz and 60Hz operation.

Circle (306) on Fast Fact Card

### Software supplies call-center with visual information

CrossStreets software was developed specifically for the wireless industry by Empower Geographics. Using graphics and database engines, these programs supply call-center representatives with visual and data-based information that swiftly identifies trouble areas. The software provides instant information about the nearest location of service providers' stores in the event that trouble is isolated to customers' telephones. The representatives can even provide directions to the stores so customers can arrange for immediate repairs. Such features mean that new providers can get their call centers up and running quickly.

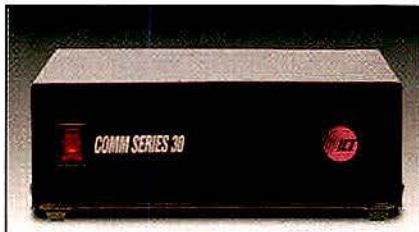
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### Interface unit allows simultaneous conversations

The CBI-5 from JPS Communications is a crossband interface system that enables multiple, independent, simultaneous conversations between different types of communications systems. The unit can be connected to VHF, UHF, telephone, cellular and satellite systems and will allow intercommunications between any or all of these systems. The CBI-5 is modular for easy expansion. The standard configuration includes five radio modules and one telephone module, but as many as 12 modules of any type can be installed in one chassis. Options include HF radio interface and local telephone modules.

Circle (307) on Fast Fact Card

### Power supply boasts low weight and low profile



The ICT Comm series 30 (25A continuous) switching power supply features a low-profile, lightweight, standard mo-

bile radio footprint. It comes equipped with a terminal block connector, MOSFET design, fuse and over-voltage protection, and current limiting. Extra filtering provides a virtually noise-free environment for a wide range of communication equipment and 12V accessories. Available options for the ECT 12012-30A are standard desktop, rack mount, LCD meter, rack mount with meter and wall-mount brackets.

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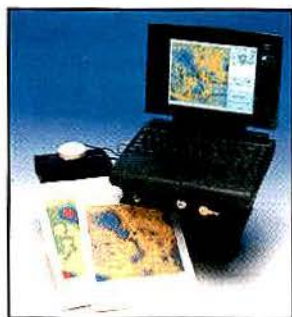


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## Mobile signal measurement system provides coverage analysis for analog, digital systems



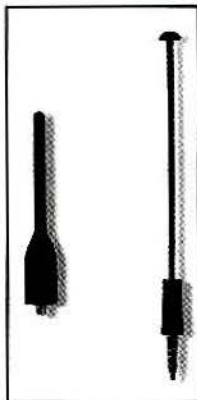
Survey Technologies' STI-9100FS mobile signal measurement and coverage analysis system is for AMPS, GSM, TACS, IDEN, SMR, ESMR and NAMPS wireless networks. The GPS-based system automates the drive-test measurement and analysis of wireless communication system signal parameters across geography. Informative real-time displays show measurement positions and the location of the vehicle over street information. Signal measurement results, in real time, are also displayed for all frequencies being measured during the drive test. A DTI Fastscan receiver with a user-selected interface is integrated into the mount under the laptop. After drive testing, the system provides the user with color contour plots of network coverage and C/I calculations based on the signal data collected.

Circle (309) on Fast Fact Card

## Multiband antennas work with cellular, PCS phones

Centurion International's portable multiband retractable and fixed antennas are for the most popular cellular and PCS phones. Based on the Centurion ECPU (retractable) and fixed cellular antenna styles, these three styles are for dual-band phones. The ECPU multiband antenna operates as a halfwave at DCS and PCS and as a quarterwave in AMPS and GSM modes, and it features integral impedance switching. The 65mm dual-band fixed antenna is halfwave on PCS and DCS and quarterwave for AMPS and GSM with a self-contained matching circuit requiring no additional matching in the phone. The 30mm stubby multiband antenna is a quarterwave at both PCS and cellular and also requires no additional matching in the phone. These antennas feature injection-molded elastomer and a flexible core.

Circle (310) on Fast Fact Card



## Paging terminal works with existing infrastructure

The Phenx TK4000 from TekNow is based on the Phenx open architecture, and it supports numeric and alphanumeric paging and voice mail. It is a customizable paging terminal that is compatible with the industry's existing paging infrastructure. The terminal features a graphical user interface (GUI) with online help, extended subscriber function, integrated C2 level security, real-time system monitoring and alarming, remote access and control, as many as 40,000 hours of voice-mail storage and support for industry standard billing interfaces. It will accommodate customer databases with 1,000 to more than 1 million subscribers. The terminal comes with fault-resistant, hot-swappable components. Redundant configurations with high-speed automatic switch-over systems are also available.

Circle (311) on Fast Fact Card

## Fader, simulator transmits CDMA channels



Berkeley Vari-tronics Systems' CDMA fader and simulator simulates IS-95B base station transmissions, similar to the company's existing multichannel TDMA fader and simulator. It transmits six CDMA channels per rack and includes independent RF frequency, amplitude, modulation and fading characteristics for each channel.

Circle (312) on Fast Fact Card

## Coax assemblies feature water-blocking compound

Watertight, flexible jumper cable assemblies with a 10-year warranty are available from Times Microwave Systems. The assemblies are from the LMR-DB cable, which includes a water-blocking compound to prevent water migration and passes ASTM D4565, REA PE-39 and ANSI S-84-608 watertightness tests. The assemblies are available with Type-N, 7/16 DIN and EIA flange connectors in male, female and right-angle configurations. The connectors all have silver-plated electrical paths and hex coupling nuts on the male connectors. The assemblies are tested for VSWR and insertion loss over the frequency range of 800MHz-2,000MHz.

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## TRANSMITTER LOCATION



New fixed site direction finders provide 2 degree accuracy, and include software for triangulation from a central control site. Mobile versions also available covering 50MHz to 1 GHz

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## New products

### Testing confirms increased temperature range of batteries

**Hawker Energy Products** has extended the operating temperature range for the Cyclon single cell product line. Because of the increasing use of battery backup in outdoor applications, the company conducted tests and verified that pure lead-tin rechargeable batteries perform through a temperature range of  $-65^{\circ}\text{C}$  to  $80^{\circ}\text{C}$ . Previous specifications indicated a temperature range of  $-65^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ . The batteries can survive continuous exposure of  $80^{\circ}\text{C}$  for as long as 60 days.

Circle (314) on Fast Fact Card

### Alpha pager offers guaranteed message delivery

**Wireless Access'** Accessmate is an alphanumeric text pager capable of supporting a broad range of functions ranging from registration-only to guaranteed message delivery to transmitting of preprogrammed messages. The pager supports Motorola's Reflex paging protocol. The pager is flexible as a messaging platform, allowing carriers to offer a single product to the end user with multiple service options. The pager can provide guaranteed message delivery by acknowledging receipt of a message on a per-message basis. When the user is out of range or when the pager is turned off, messages are stored and then forwarded to the pager when it is back on or within range.

Circle (315) on Fast Fact Card

### Mount allows servicing of printer



The HP Desk Jet 340 printer mount from **Gamber-Johnson** allows you to take your printer in your vehicle. The mount secures the printer in a safe, stationary position. Fully functional inside the mount, the printer's replenishing supplies may be added without having to remove the printer from the mount. The mount is made of 14-gauge steel, assuring rugged support.

Circle (316) on Fast Fact Card

### Disguised, dualband, broadcast antenna resembles OEM antenna



**STI-CO's** disguised dualband broadband antenna replaces the factory-installed OEM AM and FM antenna, and looks exactly like it. The VHF and UHF models are customized for select Chrysler, Ford, GM and Euro-Asian body styles. A broadband antenna system that requires no field tuning or alterations, the VHF bandwidth covers 24MHz

(150MHz-174MHz), and the UHF spread is 34MHz (406MHz-440MHz). The complete, ready-to-install system includes the dualband antenna, duplexer, AM and FM broadcast coupler, feedlines and a choice of connectors. Designed for law enforcement interagency communications, the dualband function of this product eliminates the need for additional vehicular antennas. With the addition of the AM and FM broadcast coupler, the antenna becomes a single tri-band unit.

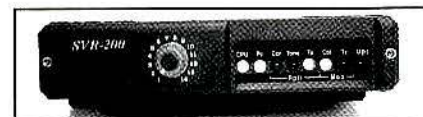
Circle (318) on Fast Fact Card

### Tapered monopoles offer mounting adaptability

**PiRod's** tapered monopole is for aesthetic adaptable antenna mounting in restrictive zoning areas. The 18-faceted surface design approximates a round cross section for reduced wind loading. A minimal flat surface area reduces glare and thermal distortion in locations where intense sunlight prevails. The monopole is constructed from high-yield-strength steel. A flange is added to the base of the pole, for extra support. Openings and exits for transmission lines, removable climbing rungs, lifting lugs, rotatable tops and platforms, and cable-type safety climb systems help service personnel do their jobs effectively and safely. Poles are available in heights as high as 180 feet.

Circle (317) on Fast Fact Card

### Vehicular repeater extends range of hand-held; operates 14 channels



**Pyramid Communications'** model SVR-214 provides extended range for a UHF or VHF hand-held by crossband repeat with an existing mobile. The SVR-214 is Motorola PAC/RT, PC-programmable and capable of 14-channel operation, allowing the use of several portable frequencies without the need to reprogram the vehicular repeater. The SVR-214 features priority sampling, "first man out," multivehicle operation (as many as 256 units), local mic repeat and adjustable power as great as 2W.

Circle (319) on Fast Fact Card

### Direction-finding system locates radio transmitter



With **Doppler Systems'** mobile direction finding (DF) systems, the location of an active radio transmitter shows up automatically on the screen of a laptop computer. Using the Autotrack software

program supplied with the system on the user's laptop computer, lines of bearing (LOB) may be recorded on a digital map. A GPS receiver, supplemented by an optional magnetic compass, is used to measure the vehicle's location and heading, which are displayed as an icon on the map. LOBs are also shown on the map originating from the icon. When the user determines that a valid bearing is displayed, the LOB is stored, and the icon changes. By driving to another location and taking another LOB, the intersection indicating the emitter location is found.

Circle (320) on Fast Fact Card

### Cylindrical NiMH battery offers high capacity, long running time

**Panasonic Industrial's** NiMH battery, the cylindrical HHR150AA, offers a minimum capacity of 1,500mAh—an increase of about three times the capacity of standard NiCd batteries. The battery uses an AB5-type hydrogen-absorbing alloy. It features an energy density of about 240Wh/l for the conventional NiCd. Users

can expect a long time between charges and a long running time. The one-hour recharge and stable discharge characteristics make the battery suitable for personal digital assistants, cellular telecom products and other high-energy applications.

Circle (321) on Fast Fact Card



## Book covers digital, cellular receiver technology

*Communications Receivers* by Ulrich L. Rohde, Jerry Whitaker and T.T.N. Bucher, from **Intertec Publishing**, has been revised and updated to cover state-of-the-art digital and cellular technology. This edition is a guide to the theory and design of all types of communications receivers, including shortwave, military, broadcast and direction-finding. This resource explains the basic principles of operation and shows how to apply those basics to produce a working communications system. The edition features mate-

rial on the latest advances in cellular and digital systems, discussions of selectivity and dynamic range, specifics on design approaches, circuitry and components, details on the use of microprocessors and logic devices and coverage of special modes such as pulse and data. Supporting mathematics is provided where appropriate, and extensive technical illustrations and schematic drawings are used throughout to give the reader a solid grasp of fundamental principles.

Circle (351) on Fast Fact Card

## Interactive, on-line catalog features more than 10,000 products

**Marketronics** has recently converted its *Product Selection Guide* into an interactive on-line catalog, complete with specifications, pricing and ordering capabilities. From antennas to test equipment, the user-friendly interface allows you to locate the items you require with a few clicks. Search the database of more than 10,000 items representing more than 100 manufacturers by product type or part number. The site is designed for fast download, containing minimal graphics and being compatible

with several browser types. Ordering is simple and straightforward, using the familiar "shopping basket" format. Each client receives an identification number and password, so that shipping information needs to be provided only once. Orders are encrypted, then transferred via Secure Server transaction to the sales department for immediate processing. A confirmation email message is also sent to the customer with complete details of the order.

[www.marketronics.com](http://www.marketronics.com)

## Updated guide contains tower parts, accessories

The *Tower Parts and Accessories Guide* from **PiRod** is for the PCS, cellular, broadcast and microwave tower markets. Updated for 1998, the catalog details the complete line of tower parts and accessories and features the latest in antilimb device, universal side arm mounts, nonpenetrating roof mounts, cellular and PCS sector mounts and other products. The 83-page catalog includes drawings and parts specifications for thousands of products, including antenna mounts, guy components, maintenance and safety equipment, grounding materials, lighting systems and engineered components.

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## Catalog serves small business

With the **TechAmerica** catalog, hobbyists to electronics professionals can order individual electronics components, test equipment and specialized tools. The catalog serves the needs of small business and individual purchasers. There is no minimum order, and orders can be placed 24 hours a day, seven days a week.

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**Morrow**

**Mike McTighe**, managing director of the business unit of Philips Electronics, Irving, TX, advances to chief executive officer of Philips Consumer Communications.

**Bob Wise** leaves KRW United, Raleigh, NC, as project manager to join SmartLink Development, Apex, NC, as manager, international sales.

**Michael D. Kelley** joins Riser-Bond Instruments, Lincoln, NE, as vice president of sales after working as vice president of sales at a snack-food company for 18 years.

**Thomas Morrow**, owner of Tomorrow Communications, a consulting business in Minneapolis, MN, joins Metroplex Mobile Data, Fort Lauderdale, FL, as vice president of sales and marketing.

**J. Daniel Moody**, director of sales, advances to vice president of strategic sales at The National Dispatch Center, San Diego.

**Bill Baker** exits Sti-Co Industries, Orchard Park, NY, as sales and marketing manager to relocate to Sausalito, CA. As a consultant to the company, he continues to handle Sti-Co's advertising and seeks other clients. Baker can be reached at 415-331-5330.

**Donald R. Goeltz**, senior vice president for corporate development of Intek Diversified, Princeton, NJ, adds to his responsibilities by becoming president of two Intek subsidiaries: Torrance, CA-based Roamer One and Kansas City, MO-based Midland USA.

**John Major**, corporate executive vice president and president of the CDMA Wireless Infrastructure Division, Qualcomm, San Diego, is elected chairman of the board of the Electronic Industries Association, Arlington, VA.

**Robert R. Cohen** departs the Personal Communications Industry Association (PCIA), Alexandria, VA, as director of Congressional Affairs to become vice president at National Strategies, Washington, DC.

Changes at Gabriel Electronics, Scarborough, ME:

**Michael Cahill**, international sales manager advances to director of international sales.

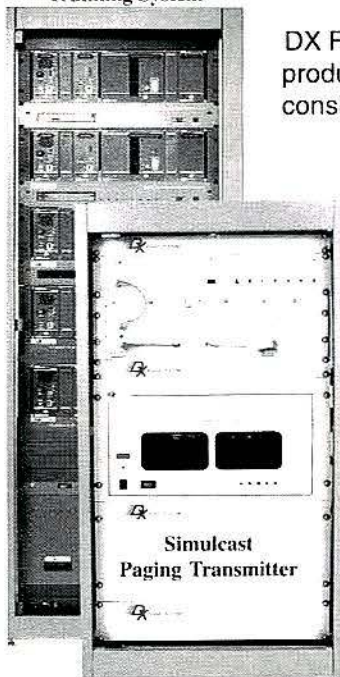
**Susan Williams**, North American sales manager, moves up to director of sales.

**Patrick Heelan** leaves Portland Steel, Portland, ME, as chief executive officer to join Gabriel Electronics as manager of installation services.



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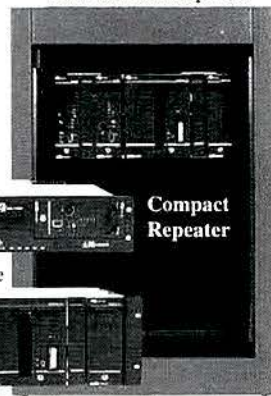
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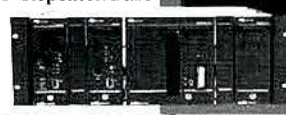


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# L

## etters from readers

### H.R. 2369: Should we have the right to monitor radio waves?

[The following is a copy of a letter sent to the California senatorial offices.]

Honorable Senators Boxer and Feinstein:

Please, please, please become 'informed' in radio and electronic communications before lending your support or even casual credibility to Rep. Billy Tauzin's H.R. 2369.

Radio signals know no boundaries. Some are dangerous and harmful to body and/or brain. (Radio waves cook your food, for Pete's sake!) Even "harmless" radio waves can contain harmful or threatening communications.

The right of the public to protect itself and to detect jeopardy, danger, and potential harm seems constitutionally guaranteed. It is not a privilege that can be deprived.

The people have the God-given right to use their eyes and ears to "detect" things visible and audible that pass through their property and bodies. Why is there a controversy over the people's right to detect radio waves that pass through their property and bodies? Radio waves are only a form of light waves—the two are fundamentally the same! And, what's more, sound waves aren't all that much different. Radio, light, and acoustical waves are—energy.

Privacy always has been and should continue to be the primary responsibility of the sender and receiver of communications. If you loudly speak of top secret matters to your colleagues in a public restaurant, do you have a reasonable expectation to privacy; i.e., are others required to plug their ears?

If one were to disrobe on a city street, would they have any reasonable expectation of privacy? Would it be incumbent on others to shade their eyes or avert their gaze? Certainly some would do so. Not all. And would those who didn't be "criminals"?

When a radio signal is broadcast "in the clear," regardless of audience and intended receiver, there cannot be any reasonable

expectation of privacy.

When we speak to others and want privacy, we lower our voices to a whisper and/or seek a secure place. When we undress for showers and bed, we do so in a private place. If we want privacy in radio communications, it is incumbent on us to implement encryption or other secure measures.

It is not incumbent on watchers to avert their eyes to public sights; nor listeners to close their ears to audible sounds; so why is it incumbent on the public to not operate a radio receiver just because some people choose to use it for their means of private communications? Why does the government feel obliged to legislate this illusion of privacy?

Please note that the cellular telephone industry first created the illusion of privacy, and then convinced the government to sanction it, re the Electronic Communications Privacy Act of 1986, and then the Telephone Dispute and Disclosure Act of 1994.

My dear Senators, I hope you can sense the preposterous nature of these Acts and those now about to follow in their wake.

Please exert your opposition to H.R. 2369 and anything resembling it. I am adamantly opposed to government imposition on harmless, passive activities that the people can do in their homes, automobiles, and other private domains that do not impinge on the rights of others... and this includes radio monitoring.

The issue crystallizes to a very simple framework: We the People of the United States of America do not have a reasonable expectation to privacy when we disrobe in public, shout in public areas and communicate via radio waves.

Respectfully,  
Bill Cheek

Citizen of California State  
Box 262478

San Diego, California 92196-2478  
619-578-9247 (1:30-5:30 p.m.  
Pacific Time)

### Corrections

In the December 1997 issue of *Mobile Radio Technology*, the fax number and Web site address were incorrect in Corp Ten International's ad. The correct fax number is 410-472-4416. The correct Web site address is [www.corpten.com](http://www.corpten.com).

In the "Company Addresses" section of the December 1997 issue, Advanced Electronic Applications appeared with a Lynwood, WA, address. That company has changed to AEA, a division of Tempo Research, and the correct address is:

AEA, a division of Tempo Research, 1221 Liberty Way, Vista, CA 92083-8307, phone: 760-598-9677, fax: 760-598-4898, Web: [www.aea-wireless.com](http://www.aea-wireless.com).

Also, in the same section of the December 1997 issue, Trident Micro Systems' address was incorrect. The correct address is: Trident Micro Systems, Two Trident Drive, Arden, NC 28704, phone: 704-684-7474 or 800-798-7881, fax: 704-684-7874, email: [sales@tridentms.com](mailto:sales@tridentms.com), Web: [www.tridentms.com](http://www.tridentms.com).

## Mobile Radio Technology

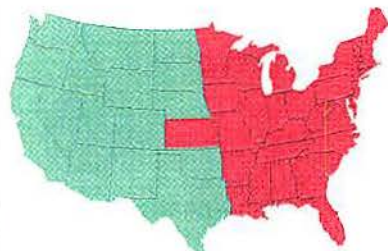
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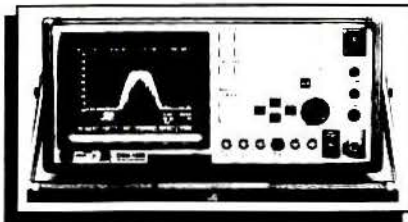
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- 16 a MT9000 900MHz H01WVC4A092A
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- 20 a SYNTOR 400MHz T43J4A5174K
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- 22 a MAXTRAC 800MHz D33M96A5987
- 23 a MAXTRAC 800MHz D33M96A5987
- 24 a TRAKAR 300MHz C03T2A5000
- 25 a MT6500 900MHz H01H3C5B76N
- 26 a MT6500 900MHz H01H3C5B76N
- 27 a GE 120 800MHz T4003101
- 28 a GE 120 800MHz T4003101
- 29 a MICR Comm. Rpt. 400MHz C04R5C35A4
- 30 a MICR Base 400MHz B04R5C3105A1
- 31 a GE MAS-1E Comm. Rpt. 400MHz P05R5A88B
- 32 a SYNTOR 1800 400MHz Y05R5A88B
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- 36 a MICR 400MHz 154H40A00
- 37 a RADIOS P50 400MHz H44K92316AN
- 38 a GE PNC-50 400MHz H45D00
- 39 a GE MY-5 400MHz H45D00
- 40 a GE MS-5 400MHz H45D00
- 41 a GE 180 400MHz H155A1B86A
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- 47 a MICR Base 400MHz H01H1B1400
- 48 a MICR 400MHz H01H2A000
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- 50 a SYNTOR 30 300MHz T11V67204AK
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- 52 a Tone and DC Detector, 117.975 MHz, Mated Under
- 53 a Tone and DC Detector, 117.975 MHz, Mated Under
- 54 a Tone and DC Detector, 117.975 MHz, Mated Under
- 55 a MT6500 125 MHz, Mated Models
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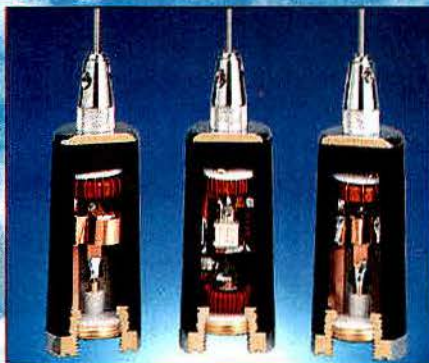
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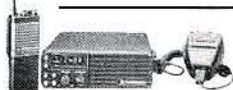
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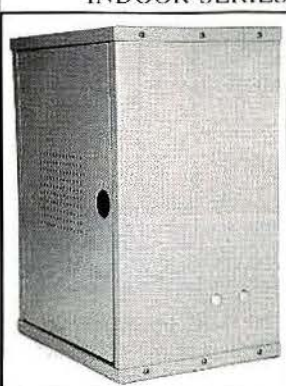


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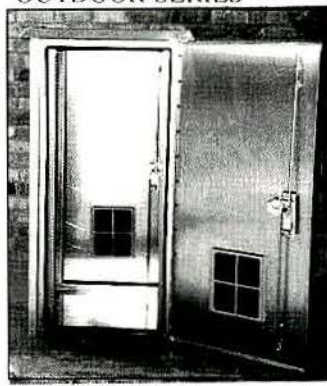
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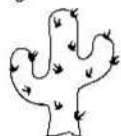
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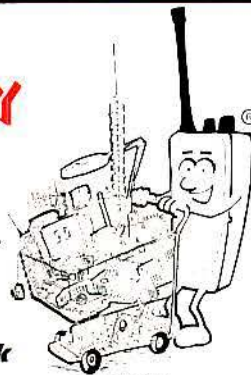
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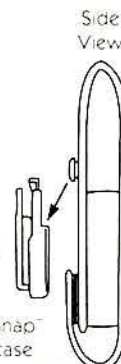
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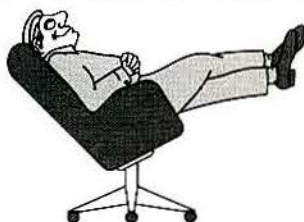
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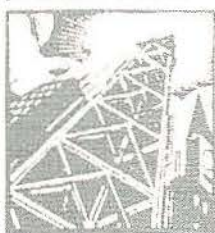
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# **A** *d index/hot line*

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AIR COMM	130	134	602-275-4505	ICT	11	19	604-888-6304
Allen Telecom Group	IBC	2	800-676-5342	IDA Corporation	51	47	701-280-1122
Andrew Corp.	30,31	14	708-349-3300	Instrument Associates	18	10	901-947-4000
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General Communications	70	121	800-356-3200	Vertex/Yaesu USA	15	8	310-404-2700
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